

# Formulation of Risk Informed GIS Based Master Plan for Shillong Planning Area, Meghalaya

Prepared by  
North Eastern Space Application Centre  
Department of Space, Govt. of India

Submitted to  
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Government of Meghalaya



# FORMULATION OF RISK INFORMED GIS BASED MASTER PLAN, SHILLONG PLANNING AREA, MEGHALAYA

**Prepared by**

Urban & Regional Planning Division,  
RSAG Group, NESAC

**Submitted to**

Department of Urban Affairs,  
Govt. of Meghalaya



**North Eastern Space Applications Centre**

Department of Space

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Abstract	<p>The study was taken up for Department of Urban Affairs; Govt. of Meghalaya towards preparation of GIS based Master Plan for Shillong, Meghalaya. The Master Plan involves the integration of spatial and non-spatial data to identify and analyze patterns and trends in the Shillong Area. The master plans also serve as a platform for stakeholder engagement, allowing people of the community to participate in the planning process as well as provide feedback on planned developments. This data is then utilized to formulate regulations for land use, transportation, environmental protection, and other aspects of city development.</p>			
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डॉ एस पी अग्रवाल/ Dr S.P. Aggarwal

निदेशक/Director

Date: 29<sup>th</sup> May, 2023

## Preface

The GIS based Master Plan for Shillong Planning area, 2041 has been prepared under Atal Mission for Rejuvenation and Urban Transformation (AMRUT) scheme, a flagship program of the Government of India.

The Master Plan promises to lay a foundation for transforming the city's aspirations into reality. The plan has been formulated, keeping in mind the vision of developing Shillong as a vibrant tourist city of the future carrying the legacy of its past with a prime focus on enhancing mobility. The concept of land use suitability and zoning is the real cornerstone of the planning process.

The last master plan for Shillong was formulated in the year 1991. Considering the growth of Shillong in the past few decades, there is a dire need to formulate a GIS based Master Plan for the next foreseeable years. The plan has been prepared with the concept of land use suitability and zoning which is a first for the city and was primarily built around land management concept. The plan identifies native planning districts based on existing and proposed development character.

The main aspects of the GIS based Master Plan for Shillong stands as sustainability and liveability. This is ensured by providing due importance to real time market driven approaches as well as providing mixed land use along transit corridor. The Master Plan also addressed city centre re-densification and aspired to create a level playing field for all future developments in and around the new Shillong Township. The re-densification through zoning regulations ensures equitable distribution of density in the planning area.

The GIS based Master Plan for Shillong aims to transform the growth prospect of the city in a planned and regulated manner thereby providing much required stress free liveability to the citizens and laying the foundation for sustained and holistic development. The prospective next decades are envisioned to be an era of happiness and content citizens living and thriving in the planned city of Shillong.

(डॉ एस पी अग्रवाल/ Dr S.P. Aggarwal)





## **ACKNOWLEDGEMENT**

On behalf of the entire project team of GIS based Master Plan for Shillong Planning Area, it is our proud privilege to express our sincere gratitude to all concerned who are directly or indirectly associated with this mission of preparation of a comprehensive GIS based Master Plan in high resolution at 1:4000 scale for the city of Shillong, Meghalaya.

The project team also extends their sincere gratitude to Department of Urban Affairs, Government of Meghalaya for providing the opportunity to get associated with the National project AMRUT, which is a foundation stone towards better societal applications.

The authors owe a depth of gratitude to Dr Shiv Prasad Aggarwal, Director NESAC for his encouragement and guidance throughout the project tenure. We highly acknowledge Dr K K Sarma, Group Head, Remote Sensing Applications Group for his time-to-time constructive suggestions.

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## ABBREVIATIONS

<b>ADC</b>	Autonomous District Councils
<b>AMRUT</b>	Atal Mission for Rejuvenation and Urban Transformation
<b>AOI</b>	Area of Interest
<b>AP</b>	Arithmetic Progression
<b>CAA</b>	Constitutional Amendment Act
<b>CB</b>	Cantonment Board
<b>CEO</b>	Chief Executive Officer
<b>CGAR</b>	Compound Annual Growth Rate
<b>CPCB</b>	Central Pollution Control Board
<b>CPHEEO</b>	Central Public Health and Environmental Engineering Organisation
<b>CT</b>	Census Towns
<b>DC</b>	Deputy Commissioner Office
<b>DEM</b>	Digital Elevation Model
<b>DEWATS</b>	Decentralized Wastewater Treatment Systems
<b>DWCUA</b>	Development of Women and Children in Rural Areas
<b>DWWM</b>	Decentralised Wastewater Management
<b>ESZ</b>	Eco Sensitive Zones
<b>EULU</b>	Existing Urban Land Use
<b>FAR</b>	Floor Area Ratio
<b>FCI</b>	Food Corporation of India
<b>FOB</b>	Foot over Bridge
<b>FSSM</b>	Faecal Sludge and Septage Management
<b>FTL</b>	Full Tank Level
<b>GI</b>	Galvanized Iron
<b>GIS</b>	Geographical Information System
<b>GP</b>	Geometric Progression
<b>GSDP</b>	Gross State Domestic Product
<b>GSVA</b>	Gross State Value Added
<b>GSWSP</b>	Greater Shillong Water Supply Project
<b>Ha/HA</b>	Hectares
<b>HDI</b>	Human Development Index
<b>HH</b>	House Holds
<b>HP</b>	Horse Power
<b>HTL</b>	High Tension Line
<b>IGP</b>	Inspector General of Police
<b>IIM</b>	Incremental Increase method
<b>IIMS</b>	Indian Institute of Management, Shillong
<b>IT</b>	Information Technology
<b>ITeS</b>	Information Technology Enabled Services

<b>JnNURM</b>	Jawaharlal Nehru National Urban Renewal Mission
<b>KHADC</b>	Khasi Hills Autonomous District Council
<b>kV</b>	Kilovolt
<b>KW</b>	Kilowatt
<b>kWh</b>	kilowatt-hour
<b>LOS</b>	Level of Service
<b>LPCD</b>	Litre Per Capita Per Day
<b>LPS</b>	Litres Per Second
<b>LU</b>	Land Utilization
<b>MB</b>	Municipal Board
<b>MBGL</b>	Meters Below Ground Level
<b>MBOSE</b>	Meghalaya Board of School Education
<b>MeECL</b>	Meghalaya Energy Corporation Limited
<b>MGD</b>	Million Gallons per Day
<b>MLA</b>	Member of Legislative Assembly
<b>MLCP</b>	Multi-Level Car Parking
<b>MLD</b>	Million Litres per Day
<b>MSME</b>	Micro Small Medium Manufacturing Enterprises
<b>MSW</b>	Municipal Solid Wastes
<b>MTD</b>	Metric Ton per Day
<b>MUDA</b>	Meghalaya Urban Development Agency
<b>MW</b>	megawatt
<b>NBC</b>	National Building Code of India
<b>NDZ</b>	No Development Zone
<b>NECTAR</b>	North East Centre for Technology Application and Reach
<b>NEHU</b>	North-Eastern Hill University
<b>NEIGRIHMS</b>	North Eastern Indira Gandhi Regional Institute of Health and Medical Sciences
<b>NEPA</b>	North Eastern Police Academy
<b>NER</b>	North Eastern Region
<b>NESAC</b>	North Eastern Space Applications Centre
<b>NGT</b>	National Green Tribunal
<b>NH</b>	National Highway
<b>NHP</b>	National Health Policy
<b>NIFT</b>	National Institute of Fashion Technology
<b>NOC</b>	No Objection Certificate
<b>NSDP</b>	Net State Domestic Product
<b>OD</b>	Origin-Destination
<b>OSS</b>	Onsite Sanitation Systems
<b>PCU</b>	Passenger Car Unit
<b>PD</b>	Planning Districts
<b>PF</b>	Protected Forests

<b>PHED</b>	Public Health Engineering Department
<b>PLU</b>	Proposed Land Use
<b>PP</b>	Population Projection
<b>PWD</b>	Public Works Department
<b>RF</b>	Reserved Forests
<b>SC</b>	Schedule Cast
<b>SCADA</b>	Supervisory Control & Data Acquisition
<b>SEZ</b>	Special Economic Zone
<b>SH</b>	State Highway
<b>SHG</b>	Self Help Groups
<b>SJSRY</b>	Swarna-Jayanti Sahari Rojgar Yojana
<b>SMA</b>	Shillong Municipal Area
<b>SMP</b>	Shillong Master Plan
<b>SPA</b>	Shillong Planning Area
<b>SSI</b>	Small Scale Industries
<b>ST</b>	Schedule Tribe
<b>STP</b>	Sewage Treatment Plant
<b>SUA</b>	Shillong Urban Agglomeration Area
<b>SWM</b>	Solid Waste Management
<b>TCPO</b>	Town and Country Planning Organisation
<b>TMC</b>	Turning Movement Count
<b>TPS</b>	Town Planning Scheme
<b>UA</b>	Urban Agglomeration
<b>UGD</b>	Underground Drainage
<b>ULB</b>	Urban Local Bodies
<b>URDPFI</b>	Urban Development Plans Formulation and Implementation
<b>V/C</b>	Volume to Capacity ratio
<b>WPR</b>	Workforce Participation Rate





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# 1 INTRODUCTION

## 1.1 BACKGROUND OF THE STUDY

Government of India launched Atal Mission for Rejuvenation and Urban Transformation (AMRUT) in 2015 as Centrally Sponsored Scheme with the objectives to:

1. Ensure that every household has access to a tap with assured supply of water and a sewerage connection
2. Increase the amenity value of cities by developing greenery and well maintained open spaces (e.g. parks); and
3. Reduce pollution by switching to public transport or constructing facilities for non-motorized transport (e.g. walking and cycling). One purpose of the Mission is to improve governance through a set of Reforms. During the Mission period, 11 reforms are being implemented.

Formulation of GIS-based Master/Development Plans for 500 AMRUT Cities is one of the important reforms under AMRUT, which has been approved as a 100% centrally funded sub scheme with budget outlay of Rs. 515.00 crores.

The objective is to develop common digital geo-referenced base maps and land use maps using Geographical Information System (GIS) and Master Plan Formulation.

The major Components of the sub scheme are:

**Preparation of Base Map & Thematic Maps:** Final base maps in the form of user-friendly spatial products at the functional scale of 1:4000 having defined layers as per Design & Standards. City /town base map and thematic maps including existing land use map which is prerequisite for formulation of master plan and other plans.

**Urban Database Creation:** Sector wise data collection and data analysis report of 25 aspects as per Design & Standards.

**Formulation of Master Plan:** As per State Town & Country Planning Act, which includes demand assessment, identification of issues, projected requirements, development strategy and draft proposals on the GIS base map and sector wise data analysis.

**Capacity Building:** Build capacity among town planning, line departments and other concerned personnel at State and local levels including ULBs and development authorities to create a cadre of professionals proficient in the use of GIS technology for using and updating databases in urban planning and management.

**Special Assistance to States for Capital Investment 2023-24 (Part III):** The risk informed master plan as one of the reform components, assessing and incorporation of vulnerable and risk areas into the plan and preparation of mitigation plan.

## 1.2 CITY PROFILE

### 1.2.1 ABOUT SHILLONG

Shillong city, commonly termed as the "Scotland of the East" is situated in the East Khasi Hills district of Meghalaya, the district headquarters and the main centre of administrative, commercial and educational activities. The city is situated at an average altitude of 4,908ft. (1,496 m) above sea level.

Shillong the capital city of Meghalaya, which was planned by the British as a hill resort, has undergone substantial change – both in character and form. A small administrative headquarter of the erstwhile Assam State has now become a vibrant city with commercial activity overshadowing the hill resort. Shillong is one of the few hill stations with motorable roads all around the city. It has its own charm, different from other hill stations, and presents a natural scenic beauty with waterfalls, brooks, pine grooves and gardens. Due to its latitude and high elevation Shillong has a sub-tropical climate with mild summers and chilly to cold winter. Shillong is subject to vagaries of the monsoon.

Shillong has no railway lines. The Shillong Airport (also known as Barapani Air Force Base or Umroi Airport) is located around 35 km from Shillong. The nearest major airport and railway station is at Guwahati which is 104 km from Shillong.

### 1.2.2 HISTORY

The name 'Shillong' is derived from a deity named Shyllong. The city was founded by Col. Henry Hopkinson, Commissioner of Assam in 1864. During the British rule, it consisted of a few clusters of hamlets which were scattered. The British Administration shifted the headquarters of United Khasi and Jaintia Hills District from Sohra (Cherrapunjee) to Shillong. The city became its provincial capital in 1874 when the State of Assam was created out of Bengal. The city became capital of new state of Meghalaya on 21<sup>st</sup>Jan, 1972 while Assam moved its capital to Dispur.

### 1.2.3 REGIONAL SETTING

Shillong city lies in the Centre of Shillong Plateau between Brahmaputra and Surma valleys and is surrounded by hills namely Lum Sohpetbneng, Lum Diengiei and Lum Shillong. The Regional Setting Map of Shillong is depicted below in *Figure 1-1*.

### 1.2.4 TOPOGRAPHY

Shillong is situated at an altitude of 1496 m above mean sea level. It lies on the low-grade metamorphic rocks of the Shillong group, predominantly of quartzite with subordinate phyllites and slates. The quartzites band dip at 20° to 40° in the North - North East to South - South - West direction. Usually, the rock bands are found at a depth of 1 metre to 3 meters

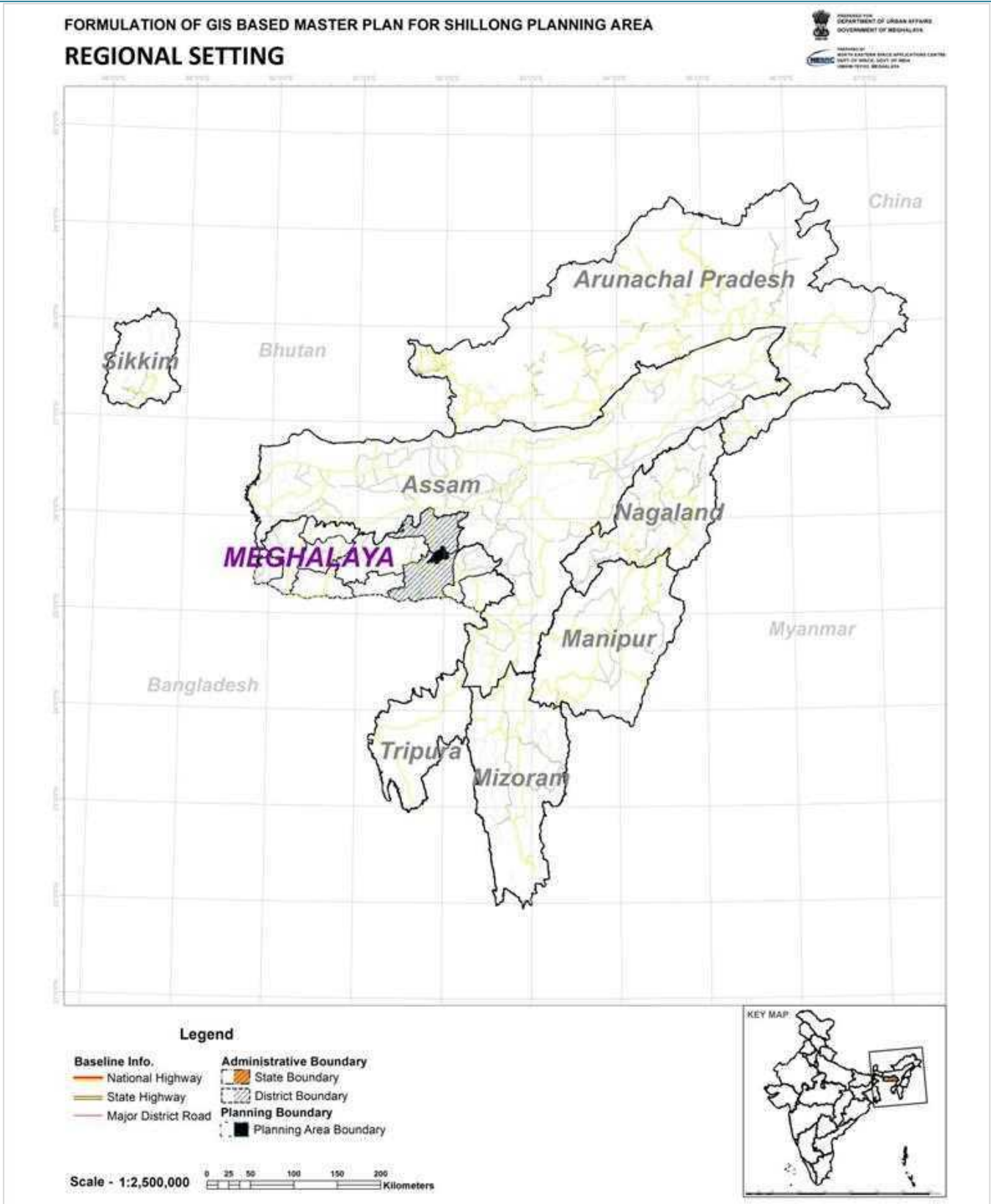


Figure 1-1: Regional Setting Map of Shillong

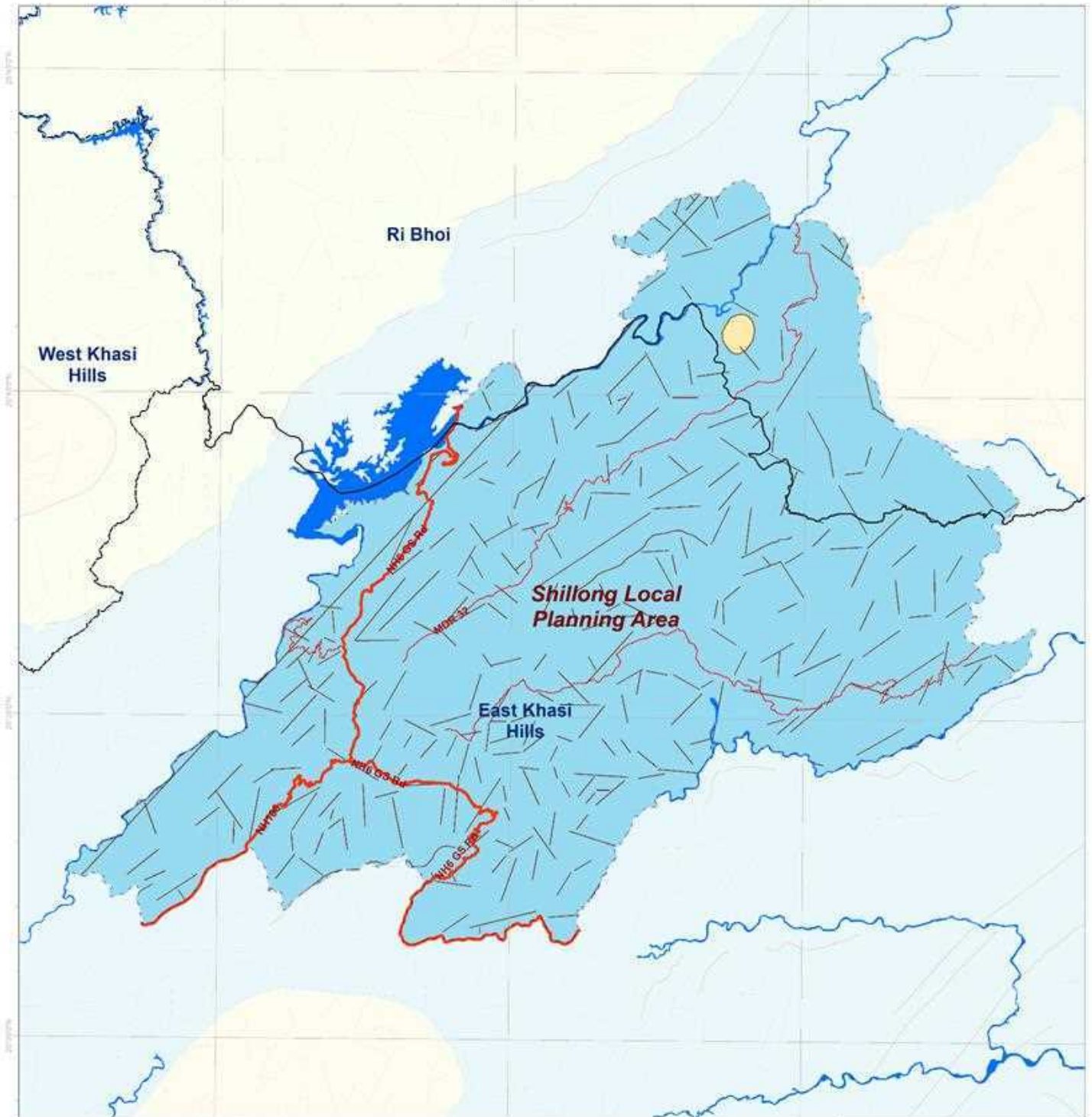
from the top soil level, except where the crusted quartzite bands are exposed. The rock base is suitable for development purposes. Shillong being in the seismic zone, prominent lineaments and a major shear zone (Tyrsad - Barapani Sheer) occur in the near vicinity. However, there is no major fault thrust within the Master Plan Area. The *Figure 1-2* shows Major Tectonics features of SPA.

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA

MAJOR TECTONICS FEATURES

PREPARED FOR  
DEPARTMENT OF URBAN AFFAIRS  
GOVERNMENT OF MEGHALAYA

PREPARED BY  
NORTH EAST REGION SPACE APPLICATIONS CENTER  
DEPT. OF SPACE, GOVT. OF INDIA  
SHILLONG, MEGHALAYA



Legend

- |                       |                                |                             |
|-----------------------|--------------------------------|-----------------------------|
| <b>Baseline Info.</b> | <b>Administrative Boundary</b> | <b>Geology</b>              |
| — National Highway    | --- District Boundary          | ■ Granite(Myellium Granite) |
| — State Highway       | --- Planning Boundary          | ■ Gneiss                    |
| — Major District Road | --- Planning Area Boundary     | ■ Quartzite(Shillong Gr)    |
|                       |                                | ■ Ultramafic Rocks          |
|                       |                                | — Linearments               |
|                       |                                | ■ Water Bodies              |

Scale - 1:75,000

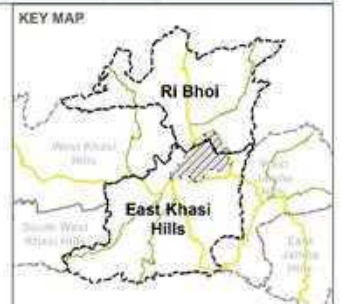


Figure 1-2: Major Tectonics Features of SPA  
Source: Ground Water Prospects: Meghalaya- NESAC, 2006

## 1.2.5 CLIMATE

The city features a sub-tropical high land climate. In summers, it is cool and rainy while in winters with average minimum temperature of 4.4<sup>0</sup>c cool and dry. The monsoon period is June to August collectively. Climate data of Shillong is depicted below in *Table 1-1*.

Table 1-1: Climate Data of Shillong 2022

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average High(Celsius)	12	18.3	22	22.4	26.1	27	27.5	28	26.3	22.5	19	19.3	22.5
Average Low(Celsius)	4.2	6.5	11.8	14.6	15.8	19.6	21.2	20.3	19.5	15.3	7.5	4.9	13.4
Rainfall (mm)	12.65	21.75	51.85	128.85	273.24	468.34	395.24	316.94	294.24	193.14	45.5	11.3	2213
Avg. Rainy days	3.55	3.95	7.55	13.75	22.05	24.85	25.15	24.15	22.75	13.15	5.05	2.75	168.7

Source: World Metrological Organization

## 1.2.6 CONNECTIVITY

Shillong is well connected by a network of roads within the State and with all-important cities in the neighbouring states. It is connected with the rest of the country through Guwahati by road, rail and by air. Helicopter service is also available between Shillong-Guwahati- Shillong and Shillong -Tura. It is one of the few hill stations with motorable roads all-round the city.

### A. By Road

It is well connected by roads with all major North-Eastern States through NH-40 with Guwahati (103 km) and through NH-44 with Tripura & Mizoram. Taxi Services are also available to destination like Guwahati, Agartala, Dimapur and other North Eastern towns/cities.

### B. By Rail

Shillong has no rail link and the nearest railway head is 103 km at Guwahati (Assam)

### C. By Air

Shillong has Umroi Airport at about 30.02 km away from the city through by-pass road. The other nearest international airport is at Guwahati as a distance of 123 Km. Shillong has a direct flight to Kolkata, Dibrugarh and Agartala of 45 minutes from Kolkata. Shillong also has a helicopter service connecting Shillong to Guwahati and Tura.

### 1.2.7 DIGITAL ELEVATION MODEL

Digital Elevation Models (DEMs) are raster files for each raster cell, with elevation data. The DEM of Shillong Planning Area (SPA) is shown in *Figure 1-3*. The model is divided into three categories: 0 – 1,000 mtrs, 1,000 – 1,500 mtrs and > 1,500 mtrs. DEMs are common for area calculations, manipulations and further analysis, and more precisely, elevation-based analysis. GIS platform has many built-in functions that are very user-friendly and will make the DEM a derivative map (Sitabi, 2015).

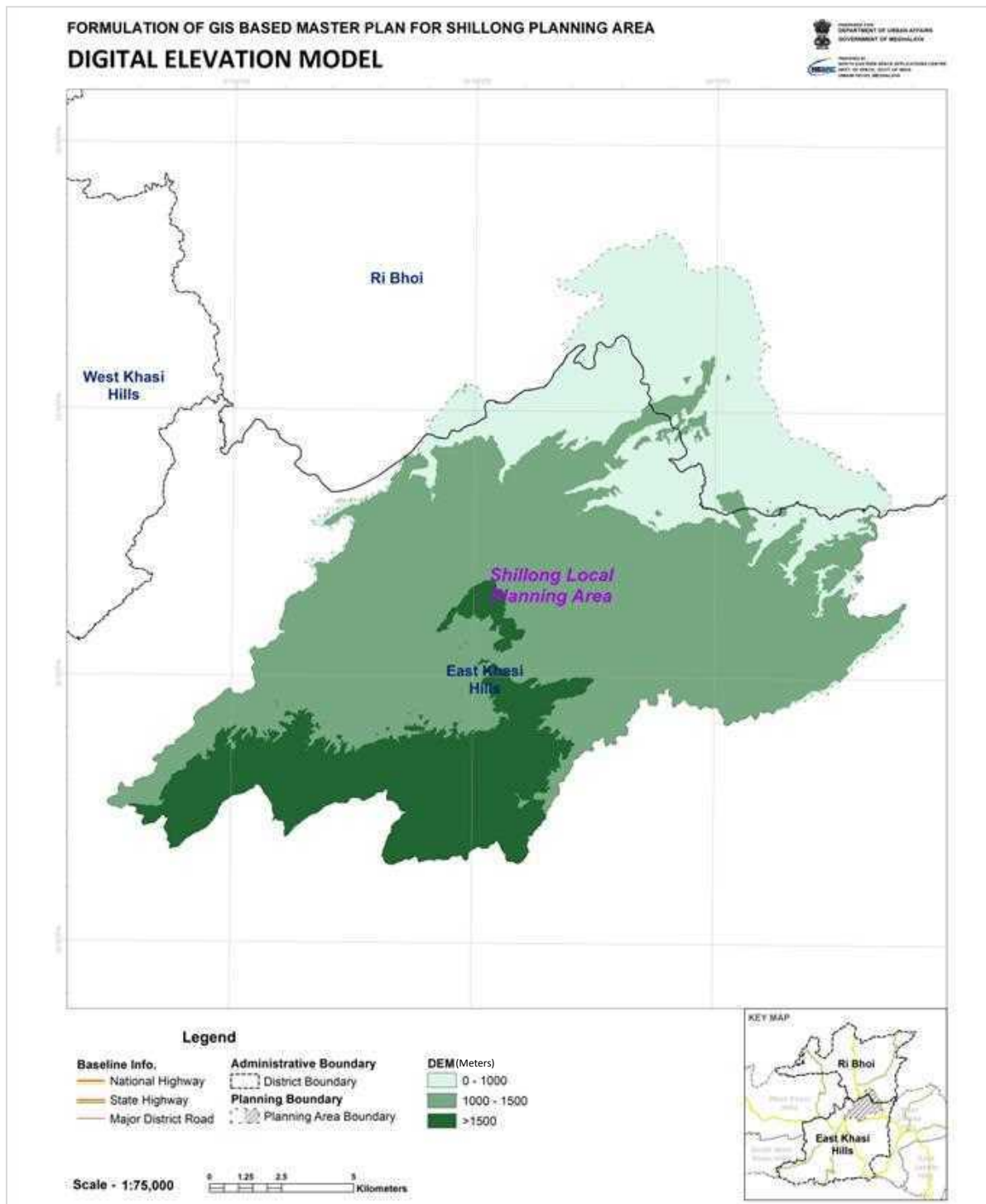
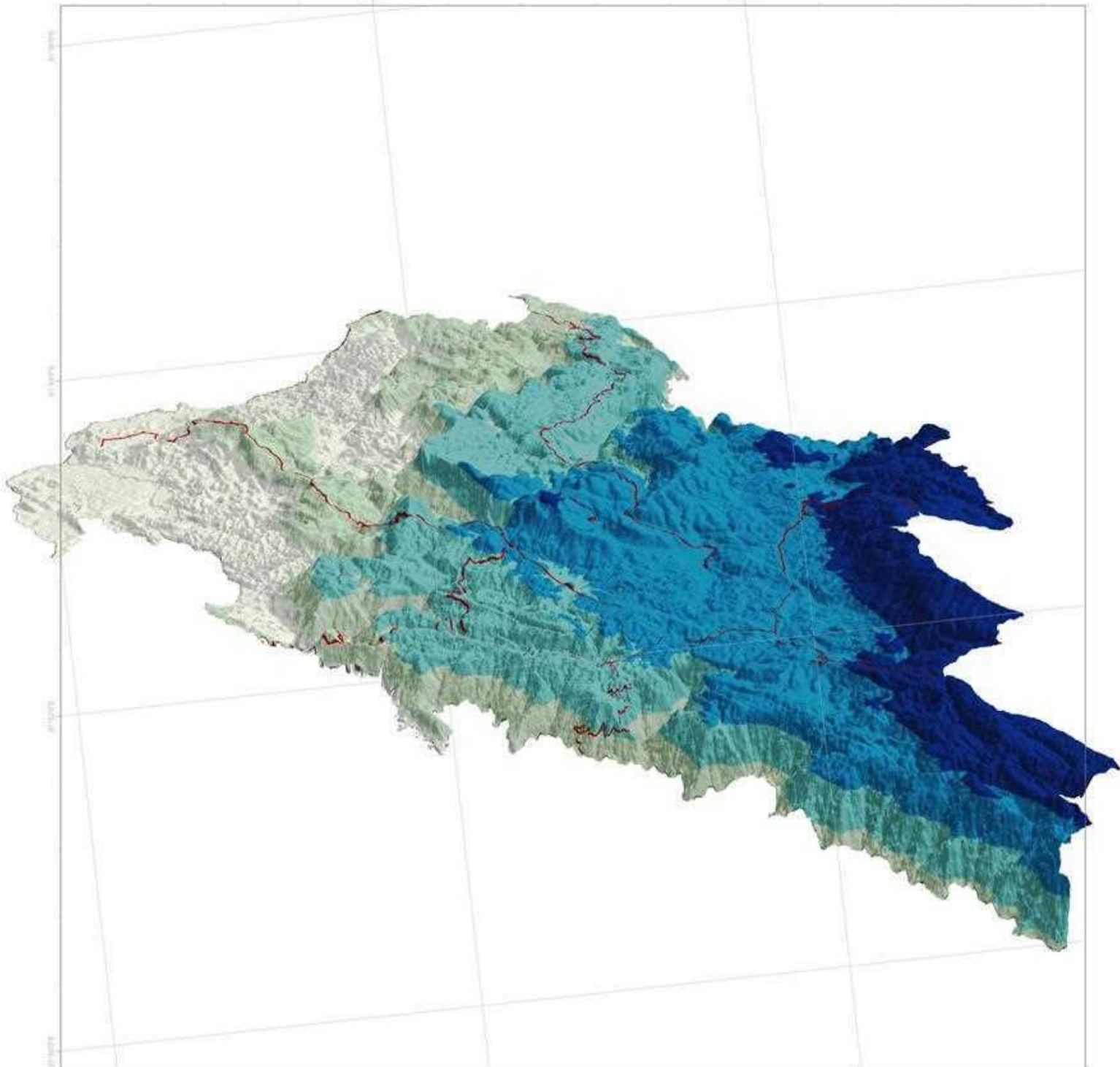


Figure 1-3: Digital Elevation Model of SPA



FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**DIGITAL ELEVATION MODEL - 3D**



**Legend**

**Baseline Info.**

- National Highway
- State Highway
- Major District Road

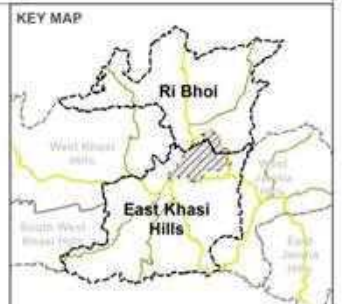
**Administrative Boundary**

- District Boundary
- Planning Boundary
- Planning Area Boundary

**DEM (Meters)**

- 830 - 970
- 980 - 1200
- 1300 - 1400
- 1500 - 1600
- > 1700

Scale - 1:25,000



### 1.2.8 SLOPE

Shillong city is on a hilly mountain; a landslide occurs due to the combination of bedrock slopes. Therefore, it is a part of the planning to consider the slopes of the study area for any future development. The study area has been classified into five classes of slope – very gentle, gentle, moderate, steep and very steep slope. Development can be considered on a very gentle, gentle and moderate slope depending on other geographical and environmental factors.

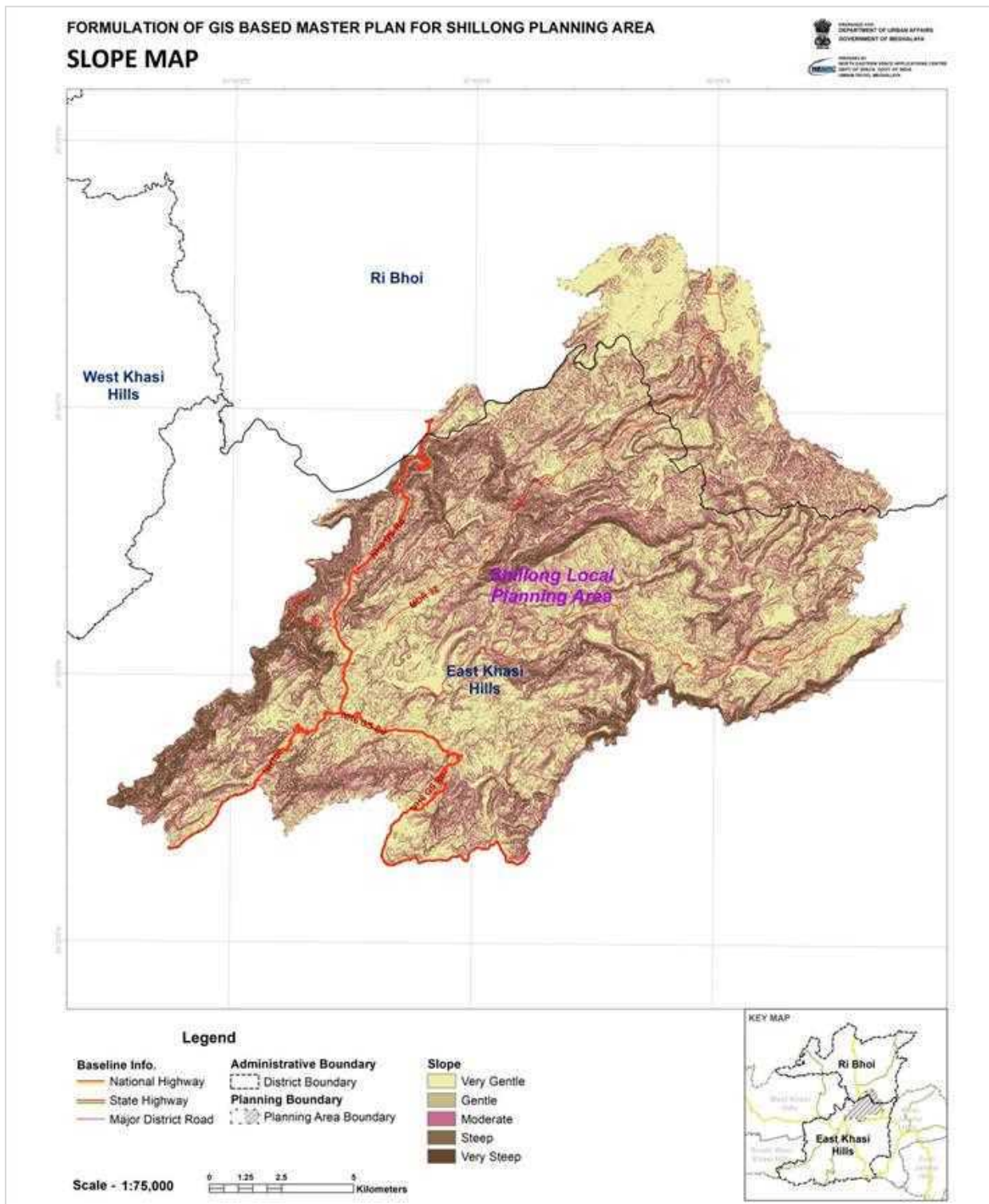


Figure 1-5: Slope Map for Shillong

### 1.3 DEMARCATION OF PLANNING AREA

As per the area of mapping the Shillong Planning Area (SPA) is approximately 288.5 km<sup>2</sup> (Figure 1-6). The planning area is bounded by:

- **North:** Shillong Eastern Bypass road in the north and north east, Umroi Mission and Umroi Cantonment in the North West,
- **South:** National Highways 40; Laitkor Peak road
- **East:** The Umkhen River
- **West:** Umiam River and Umiam Lake

The area for mapping or the area of interest (AOI) demarcated for Shillong GIS based master plan preparation is 288.5 km<sup>2</sup>. This includes the Shillong Urban Agglomeration and adjoining 54 Villages sprawled over the districts of East Khasi hills and Ri Bhoi. Out of total, 37 villages are within East Khasi Hills district and 17 villages are in the vicinity of Ri Bhoi district.

The proposed master plan area has extended from 174 km<sup>2</sup> (as per the 1991-2011) to 288.5 km<sup>2</sup> with respect to GIS Based master plan for Shillong Planning area. Major portion of the extended area is towards the north and east of the planning area. The reasons for extending the Shillong Master Plan area are:

1. The former master plan for Shillong was envisaged to cater to a term till 2011, where the population projection was estimated 380,192 and 492,761 by the year 2001 and 2011 respectively with an average growth rate of 29.8% from 1991 to 2011. Considering the dynamics of population growth at the present rate, there is an incremental demand for additional land resources. The Land resources as per Shillong master plan, 1991-2011 covers an area of 174 square kilometres. It classifies the land resources of the city into five broad categories of developed, undevelopable, developable, urban agriculture, forests and water bodies (Table 1-2).

Table 1-2: Land Resource - Shillong Master Plan (1991-2011)

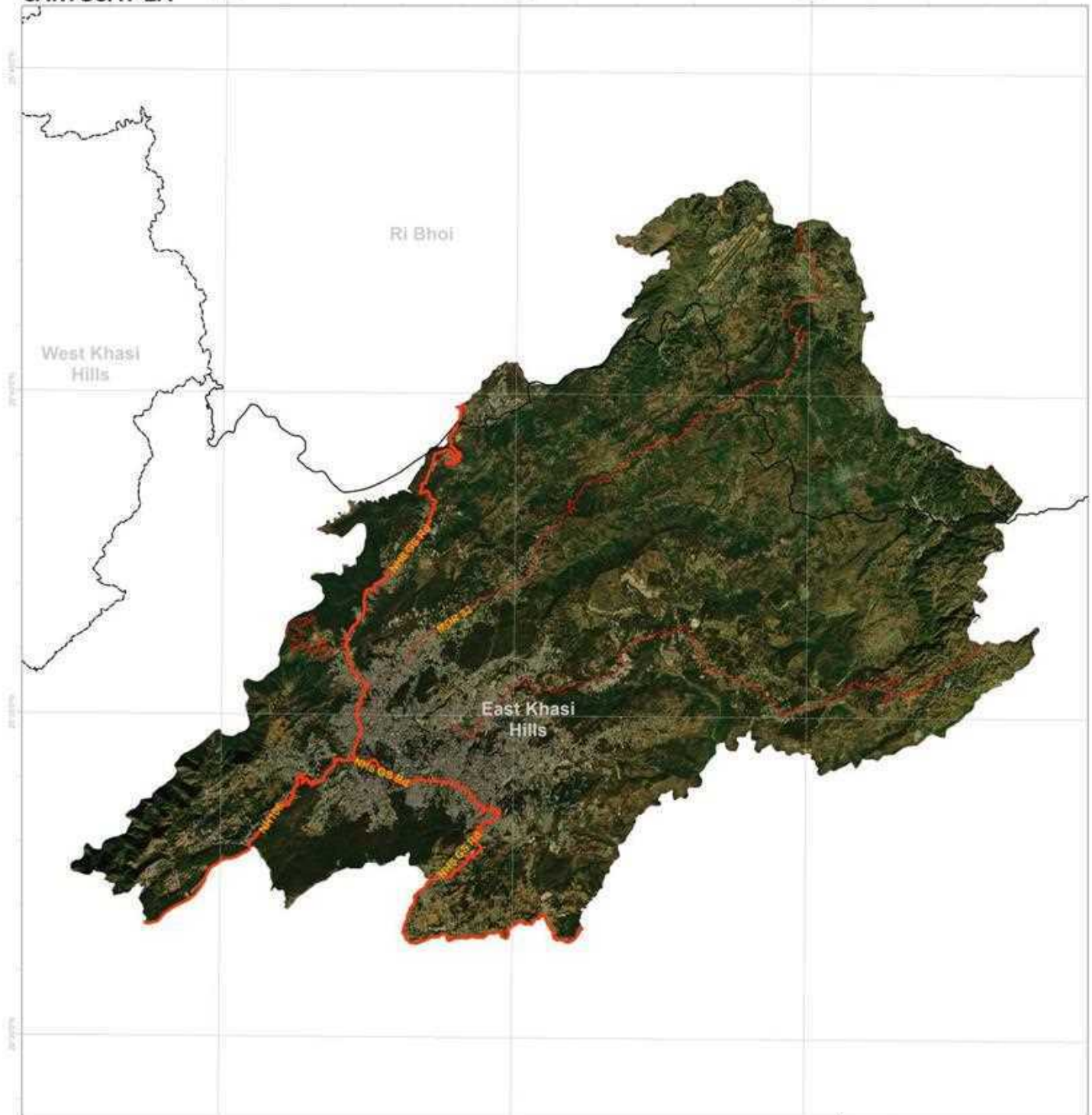
SNo	Land Use	Area (in sq.km)	Percentage
1	Developed Area	54.94	31.58
2	Undevelopable Area	15.73	9.04
3	Developable Area	50.77	29.18
4	Urban Agriculture	8.05	4.62
5	Forests & Water Bodies	44.51	25.58
<b>Total Planning Area</b>		<b>174</b>	<b>100</b>

2. It is evident that only 50.77 Sq. km was available for development, which is only 29.18% of total planning area to accommodate 4.2 lakhs of population till the year 2011. The present land resources seem insufficient as has been engulfed mostly by developmental-

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA



SATELLITE IMAGERY  
CARTOSAT-2A



Legend

- |                       |                                |
|-----------------------|--------------------------------|
| <b>Baseline Info.</b> | <b>Administrative Boundary</b> |
| National Highway      | District Boundary              |
| State Highway         | <b>Planning Boundary</b>       |
| Major District Road   | Planning Area Boundary         |

Scale - 1:75,000

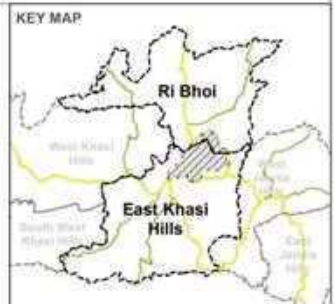


Figure 1-6: Shillong Planning Area Boundary overlaid on CARTOSAT-2S Satellite Images 10 | Page

- activities and is legitimate to include additional villages into the master plan area for Shillong.
- 3. The Shillong range on the southern edge of the master plan area is a reserved forest. This acts as impedance for future expansion of the city.
- 4. On the western part lies the Umiam River and the Rait Khwan Reserve Forest hindering any form of development and future expansion of the city. The steep slopes in these areas are highly vulnerable to landslides. In addition, heavy rainfall would make the land more unstable and causes a massive flow of debris every monsoon. Deforestation in the steep slopes due to human settlements and other activities would result in the removal of vegetation cover and will expose rocks, resulting in the weathering processes. If undergone development, these processes altogether would trigger landslides. This would cause severe disturbance to road transportation and communication.
- 5. The northern part of the proposed master plan is bordered by the Eastern Shillong Bypass Road from Umiam - Mawryngkneng, which runs at a stretch of 38 km in the study area. The emergence of Shillong Airport along the Shillong Bypass Road has been acting as a counter magnet attracting many recent developments including Government institutions and real estate's.

Table 1-3: Components of Shillong Planning Area

SNo	Name	Type	Area (sq.km)
1	Shillong Municipality	Statutory Town	10.1
2	Shillong Cantonment	Statutory Town	1.9
3	Nongthymmai	Census Town	3.6
4	Mawlai	Census Town	28.5
5	Madanriting	Census Town	2.2
6	Pynthormukhrah	Census Town	2.4
7	Nongmynsong	Census Town	1.3
8	Mawpat	Census Town	6.3
9	Umpling	Census Town	3.8
10	Nongkseh	Census Town	2
11	Umlyngka	Census Town	2.5
12	Lawsotun	Census Town	5.7
<b>Shillong Urban Agglomeration</b>			<b>70.4 (Total)</b>
Adjoining 54 Villages			218.1
<b>Total Planning Area</b>			<b>288.5</b>

- 6. Also towards the eastern part of the present master plan area, there has been setting up of new institutions. Topography being one of the most important factor influencing the spatial growth, it can be visualised that the future urban growth will be towards the northern and eastern part of the master plan area and has a huge potential for population decentralisation to accommodate the expanding city population.

With the above-discussed background, the area for mapping or the area of interest has been demarcated for the GIS-Based Master Plan Preparation Shillong Planning Area.

The *Table 1-3 and 1-4* shows the Components of SPA and List of Village within the Planning Area.

**Table 1-4: List of Village within the Planning Area**

S. No	District	Name of Village	S. No	District	Name of Village
1	Ri Bhoi	Kyrdeng	28	East Khasi Hills	Madan Mawkhar
2		Lumshyiap	29		Madan Saisiej
3		Lumsohphoh	30		Madanfootball
4		Madan Nonglakhiat	31		Mawdiang Diang
5		Mahmawdkuk	32		Mawnianglah
6		Mawiong	33		Mawkasiang
7		Mawthei	34		Mawkhanu
8		Nongsder	35		Mawklot
9		Pyllun	36		Mawkynring
10		Syllei-U-Lar	37		Mawlong
11		Umden Arka	38		Mawnarian
12		Umiam	39		Mawpdang
13		Umiam Hydrel Project D	40		Mawpynthih
14		Umiet	41		Mawsharoh
15		Umsai Prah	42		Mawtawar
16		Umsarang	43		Nongkohlew
17		Wahmyntait	44		Nongpiur
18	East Khasi Hills	3 1/2 Mile	45	Nongrah	
19		4 Th. Mile	46	Nongsawing	
20		5th Mile	47	Nongtyrkhang	
21		6th Mile Farm	48	Nongumlong	
22		Itshyrwat	49	Lapalang	
23		Kreit	50	Syllai-U-Lor	
24		Laitkor	51	Umphrew	
25		Lumdiengngan	52	Umroh	
26		Lumdiengsai	53	Umrynjah	
27		Lumkseh	54	Umshing Village	

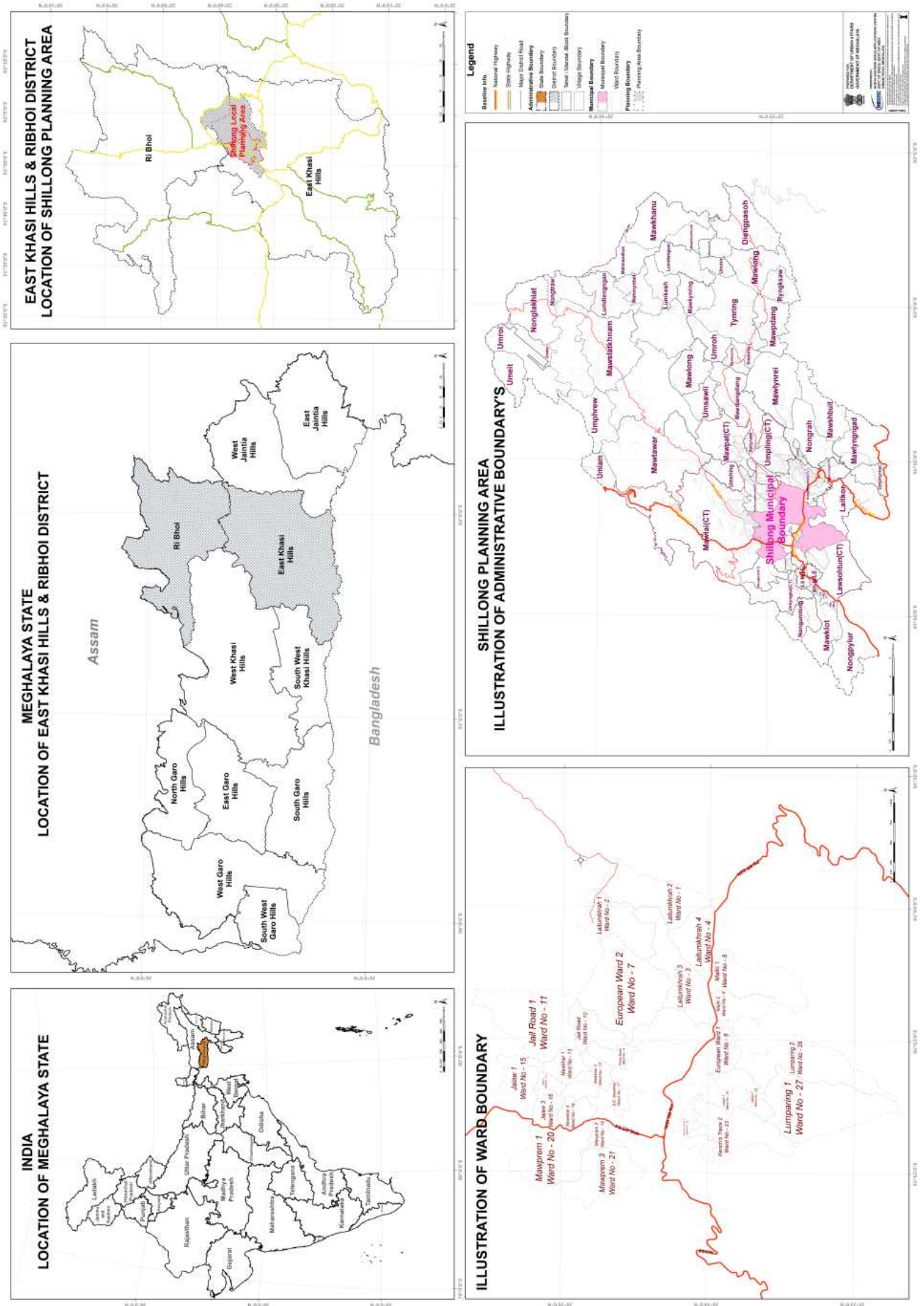


Figure 1-7: Location and Administrative setup map of Shillong





## 2 DEMOGRAPHY

### 2.1 INTRODUCTION

Demography is the study of the human composition that defines the structure of a village, a city, a region or a country. There are various factors that constitute the human composition like the population size, the population growth, the population density, the aging population, literacy rate, sex ratio, migration, the occupational pattern and the spatial distribution of these factors over the desired areas. This study is important as it helps the planning bodies to understand the trend of population change of the past and the reasons that influenced the growth or the decline of the region. It further helps them to plan for the future depending upon the estimate of the growth trend and project the population growth for the target year. This projected population further helps the government to plan for schools, colleges, health care facilities, water supply, solid waste management, power demand, housing supply etc., and how the services can be delivered efficiently to the targeted population.

The study of demographics is also important for the economic sector to plan for job opportunities for the upcoming population. It is no news that the population growth pattern of a city is different from the villages. The cities experience an exponential rate of population growth whereas villages experience a meek growth of population and sometimes even a decline in the population change. Cities being the centre of economic activities attract a lot of workforce from the surrounding villages as well as other regions of the country. This study of growing population of a city and the impact it has on the surrounding villages is important to plan better for decentralization and decongestion of the city as well as understand the direction in which the city is growing, what should be the extent of the planning area and what services needs to be provided for the new city extension.

### 2.2 EXISTING DEMOGRAPHIC PROFILE

Shillong Planning area consists of Shillong Municipal Board, Shillong Cantonment Board and 10(Ten) Census Towns which comprises the Shillong Urban Agglomeration Area and 54 other villages. Out of these villages, 15 villages fall in RiBhoi District while 39 of them are in East Khasi Hills District. Shillong City or the Shillong Municipal Area is a cosmopolitan city and has a heterogeneous composition of communities from all over India. Khasi, Jaintia and Garo are the predominant tribes in the Planning area. There are also tribes from other North-Eastern States residing in Shillong city. Other communities are Bengali, Assamese, Nepali, Marwari and Punjabi.

The following *Table 2-1* shows are the consolidated demographic statistics from Census 2011 for the Shillong Planning Area (SPA).

Table 2-1: Demographic Characteristics of Shillong Planning Area, 2011

Categorize	Stats
Total population (SPA)	4,21,377
Male Population	2,10,019
Female Population	2,11,358
Population below 6 years of age	53,741
SC Population	2,817
ST Population	2,70,494
Male Literates	1,67,200
Female Literates	1,63,918
Workforce Participation Rate (WPR)	42.79%

## 2.3 POPULATION COMPOSITION

### 2.3.1 TOWNS & VILLAGES POPULATION

The total population of Shillong Planning Area according to Census 2011 is 421,377. The average increment of growth calculated from 1971 to 2011, are the highest in the units of the Shillong Urban Agglomeration Area. The population along with the household size of all the villages, Census Towns, Shillong Cantonment Board and Shillong Municipal Area according to Census 2011 are given in *Table 2-2*.

Table 2-2: Population Composition of the Town & Villages of Shillong Planning Area

District		Towns/ Villages	House Holds (HH)	Total Population
East Khasi Hills District	Urban Agglomeration	Shillong (CB)	2473	11930
		Shillong (MB)	31025	143229
		Mawlai (CT)	10661	55012
		Pynthormukhrah (CT)	5755	27219
		Nongmynsong (CT)	3242	15017
		Mawpat (CT)	1144	6184
		Umpling (CT)	1814	8529
		Nongthymmai (CT)	8691	38004
		Madanriting (CT)	5949	29194
		Nongkseh (CT)	982	4846
		Umlyngka (CT)	1450	7381
		Lawsohtun (CT)	1623	8214
			3 1/2 Mile	285
		4 Th. Mile	251	1335
		5th Mile	271	1516
		6th Mile Farm	92	479
		Itshyrwat	30	150
		Kreit	78	444
		Laitkor	2140	10316
		Lumdiengngan	68	400
	Lumdiengsai	76	437	

District	Towns/ Villages	House Holds (HH)	Total Population
	Lumkseh	78	412
	Madan Mawkhar	60	291
	Madan Saisiej	78	428
	Madanfootball	49	274
	Mawdiang Diang	162	714
	Mawnianglah	894	3929
	Mawkasiang	98	528
	Mawkhanu	56	293
	Mawklot	346	1821
	Mawkynring	32	154
	Mawlong	124	759
	Mawiong	30	144
	Mawnarian	67	375
	Mawpdang	330	1614
	Mawpynthih	454	2518
	Mawsharoh	7	40
	Mawtawar	511	2922
	Nongkohlew	89	486
	Nongpiur	153	841
	Nongrah	1476	7316
	Nongsawing	22	130
	Nongtyrkhang	83	459
	Nongumlong	295	1554
	Lapalang	1192	6045
	Syllai-U-Lor	117	589
	Umphrew	76	337
	Umroh	86	495
	Umrynjah	92	482
	Umsawli	19	89
	Mawkynroh Umshing (Umshing Village)	617	3030
Ri-Bhoi District	Kyrdeng	60	290
	Lumshyiap	50	248
	Lumsohphoh	51	264
	Madan Nonglakhiat	138	663
	Mahmawdkuk	38	208
	Mawthei	109	625
	Nongsder	539	2879
	Pyllun	156	891
	Syllei-U-Lar	58	310
	Umden Arka	117	653
	Umiam	453	2372
	Umiet	161	757
	Umsai Prah	95	529
	Umsarang	50	267
Wahmyntait	28	129	

The population of the villages of Ri-Bhoi District, which forms a part of the planning, is very less. They are new villages with newer settlements. Nongsder and Umiam are the only two villages with substantial population. These villages have a potential to house many new services and employment opportunities.

### 2.3.2 WARD WISE POPULATION

Shillong Municipal Area has the highest population with a minimal area. The municipal area is composed of 27 wards. The area and population of each ward is given below in *Table 2-3*.

Table 2-3: Ward wise population data (2011) for Municipal Area

Ward No	Name	Population	Area(Sq.km)
1	Laitumkhrah 2	11537	0.55
2	Laitumkhrah 1	3266	0.44
3	Laitumkhrah 3	5437	0.55
4	Laitumkhrah 4	2753	0.36
5	Malki 1	4908	0.50
6	Malki 2	4888	0.23
7	European Ward 2	4891	0.90
8	European Ward 1	6009	0.59
9	Police Bazar	2145	0.12
10	Jail Road	5766	0.24
11	Jail Road 1	4863	0.76
12	Mawkhar 2	2797	0.14
13	Mawkhar 1	5337	0.16
14	Jaiaw 2	3032	0.09
15	Jaiaw 1	3838	0.28
16	Jaiaw 3	4067	0.23
17	S.E. Mawkhar	3270	0.19
18	Mawkhar 3	3875	0.14
19	Mawprem 2	4556	0.10
20	Mawprem 1	10613	0.58
21	Mawprem 3	14009	0.48
22	Kench's Trace 1	2973	0.16
23	Kench's Trace 2	8161	0.54
24	Laban 1	3568	0.15
25	Laban 2	5218	0.20
26	Lumparing 2	6319	0.65
27	Lumparing 1	5133	0.91
<b>Total</b>		<b>143229</b>	<b>10.23</b>

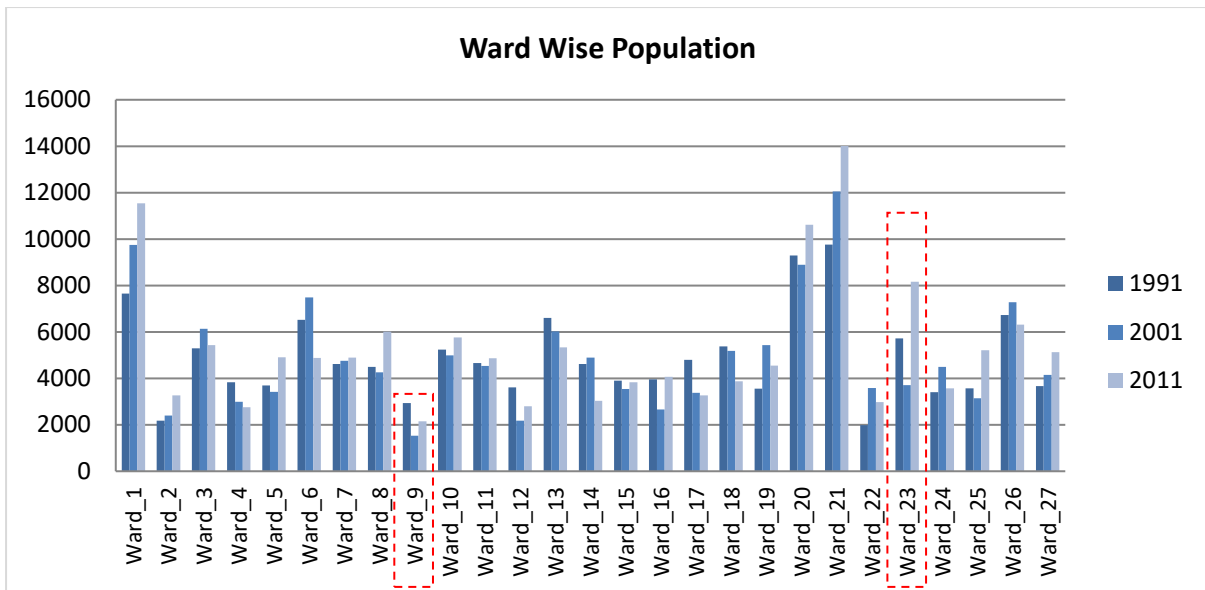


Figure 2-1: Ward wise population distribution in Shillong Municipal Area

Ward no. 21 i.e. Mawprem-3 has the highest population followed by Ward 1(Laitumkhrach 2) and Ward 20 (Mawprem-1) whereas Police Bazar, ward no 9 has the lowest population. Police Bazar is mainly the Central Business District of the city and has lesser residential areas. Nevertheless, it is a crowded zone and has a high density during working hours of the day (Figure 2-1).

## 2.4 POPULATION GROWTH RATE

Shillong is the largest city of Meghalaya and one of the most important cities of North East India. The population of the city has been growing ever since the British Headquarters was moved to Shillong in 1864. By 1872, the population of the Shillong grew from 1763 to 4000. In 1909, the Bengal Municipality Act III was extended until Shillong and by 1929, there were eleven Municipal Wards. Post-Independence, the municipal area was not extended but the wards were divided into 27 wards. These wards showed a high growth in population over the decades much more than the neighbouring urban villages. However, the Census Towns, the villages and the consolidated Shillong Urban Agglomeration Area as well as the entire Planning Area showed a higher growth rate than the Municipal Board. This shows that the other areas saw a brisk increase in population whereas Shillong Municipal Board (SMB) saw a steady growth in population. The areas outside the municipality, which makes a part of the Shillong Urban Agglomeration Area (SUA), also showed decent growth rate over the years as the municipal area grew denser. In 1961, Mawlai and Nongthymmai were characterized as the first two census towns due to its rapid growth. The decade between 1981 and 1991 saw an overall fall in growth rate except in the Cantonment Board, which perhaps experienced its best growth rate (Figure 2-2). The population of the Cantonment has been decreasing ever since and the growth rate is in negatives as per Census 2011. The population increase of the villages shows the best growth rate, much higher than that of the towns (Table 2.1).

Table 2-4: Population Growth Rate of Shillong Planning Area

Years	SPA	SCB	SMA	SUA	Rural
1971-1981	0.77	0.4	0.24	0.58	-
1981-1991	0.25	0.67	0.2	0.26	0.21
1991-2001	0.23	0.12	0.008	0.21	0.41
2001-2011	0.24	-0.03	0.07	0.19	0.66

Units in percentage

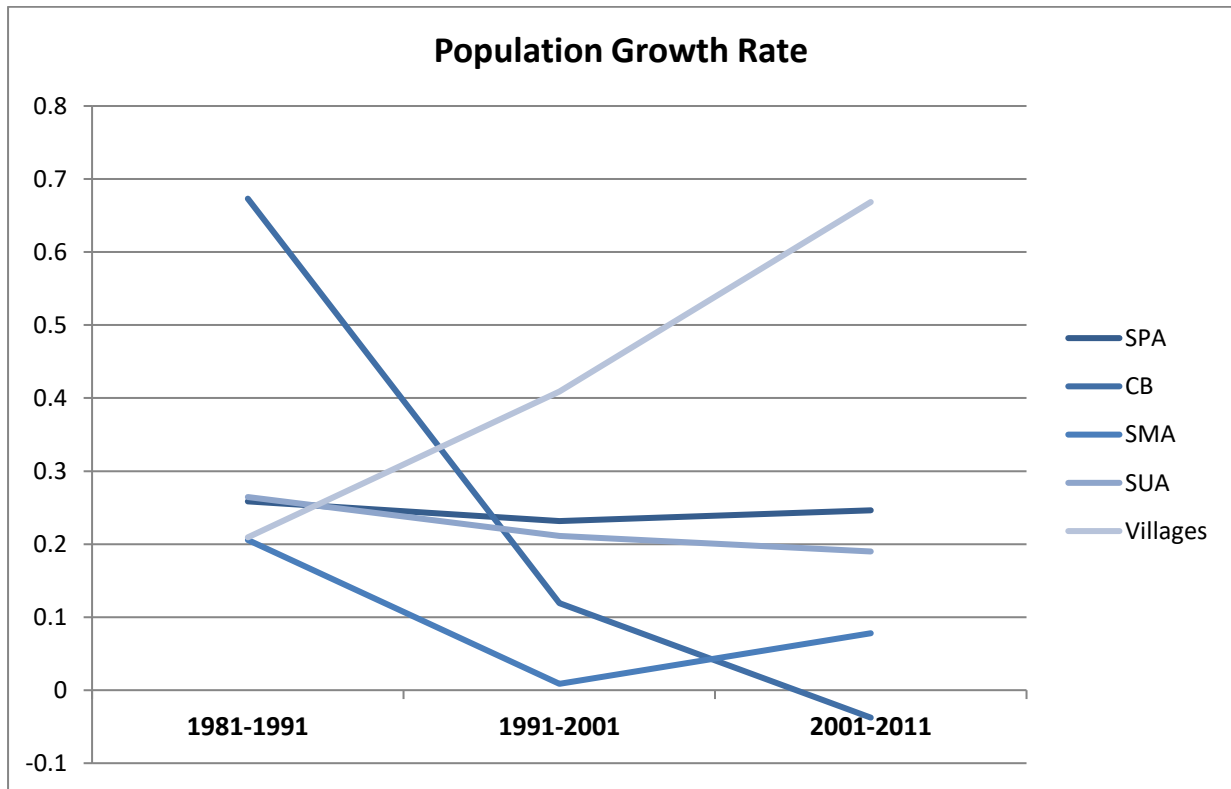


Figure 2-2: Population Growth Rate of Shillong Planning Area

## 2.5 POPULATION DENSITY

The population density of an area is the number of people in the area per the unit area. The density is the highest in the Shillong Municipal Area at 14056 person/km<sup>2</sup> followed by Madanriting (CT) at 13270 persons/km<sup>2</sup>, which are incredibly high numbers. Mawlai has the second highest population among all the census towns of the Shillong Planning Area but it has a vast area (25.46km<sup>2</sup>) under its jurisdiction which brings down its density. Nongmysong, Pynthormukhrah and Nongthymmai follows Madanriting is the highest population density list (Figure 2-3).

The population density is the highest in Mawngianglah among the villages in Shillong Planning Area which is 4759.59 person/km<sup>2</sup> followed by 5<sup>th</sup> mile, 3<sup>rd</sup> mile and 4<sup>th</sup> mile. These towns are all located next to each other towards the south west of SUA (Figure 2-4).

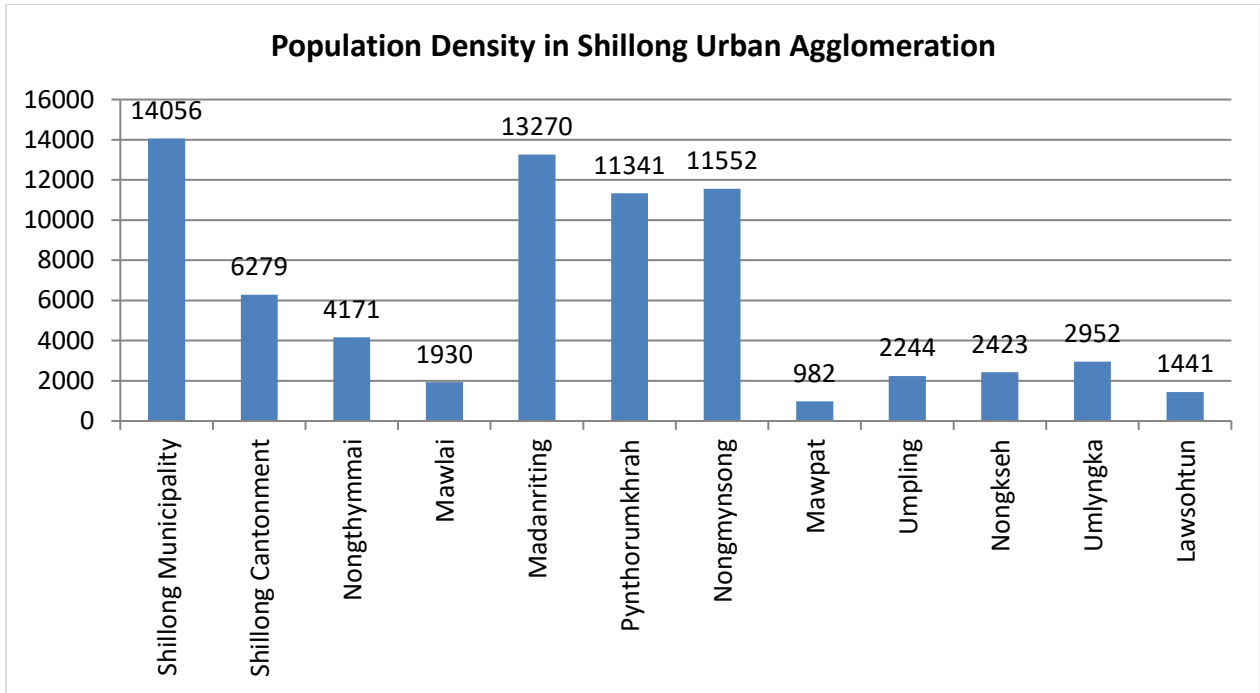


Figure 2-3: Population Density in Shillong Urban Agglomeration

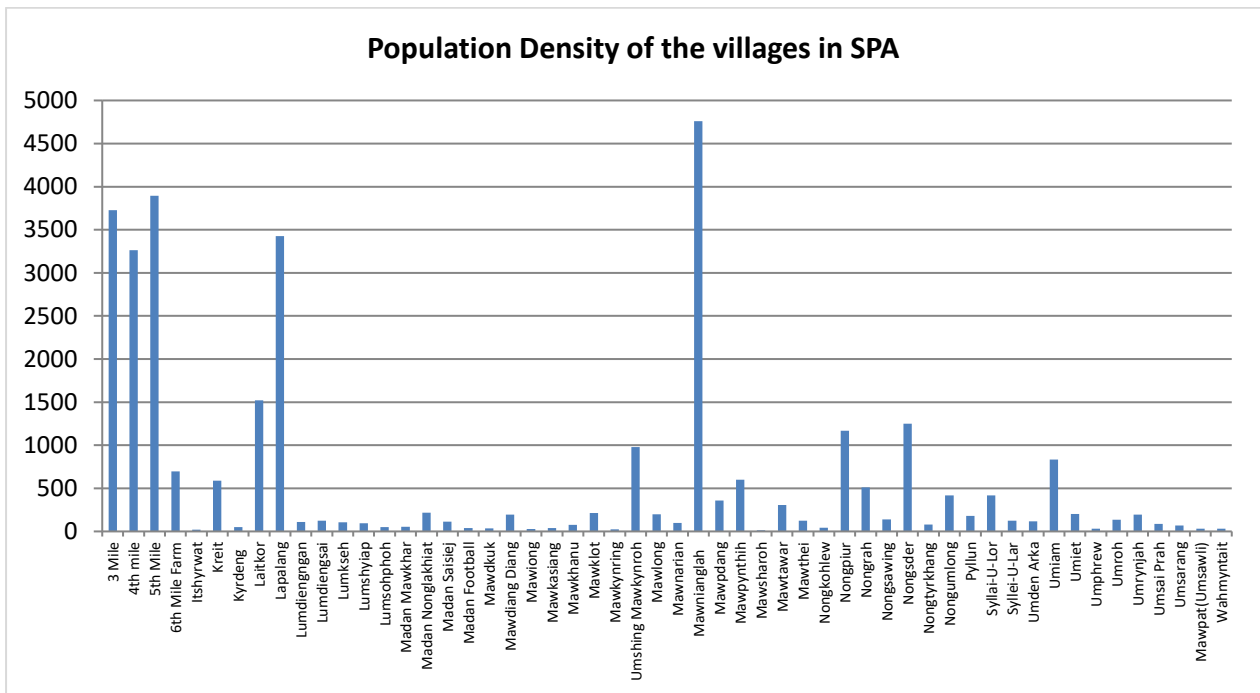


Figure 2-4: Population Density of the villages in SPA

## 2.6 SEX RATIO

Sex Ratio of a place is the number of females per 1000 males. The sex ratio of Shillong Planning area in 2011 is 1006, which is higher than the national average as well as the state average, which are 943 and 989 respectively. This means that there are 1006 females for every 1000 males. In most cases, the population of males is more than fifty percent of the total population (*Table 2-5*). The sex ratio has been growing over the years, which are a good indication of social development. Shillong Planning Area surpasses the national average rapidly currently and in the last two decades, it has shown significant improvement.

Table 2-5: Comparative Sex Ratio

Year	India	Meghalaya	Shillong Planning Area (SPA)
1991	927	967	910
2001	933	972	970
2011	943	989	1006

The sex ratio of Shillong Municipal Area (SMA) has been constantly performing well along with Census towns and the villages (*Table 2-6*). The sex ratio of the Cantonment Board is lesser because military personnel who are posted to Shillong mainly inhabit it and many of their families live in their hometowns (*Figure 2-5*).

Table 2-6: Sex Ratio in SPA

Year	1991	2001	2011
SMA	892	1010	1042
SCB	668	748	727
CTs	956	954	1002
Villages	937	980	1001

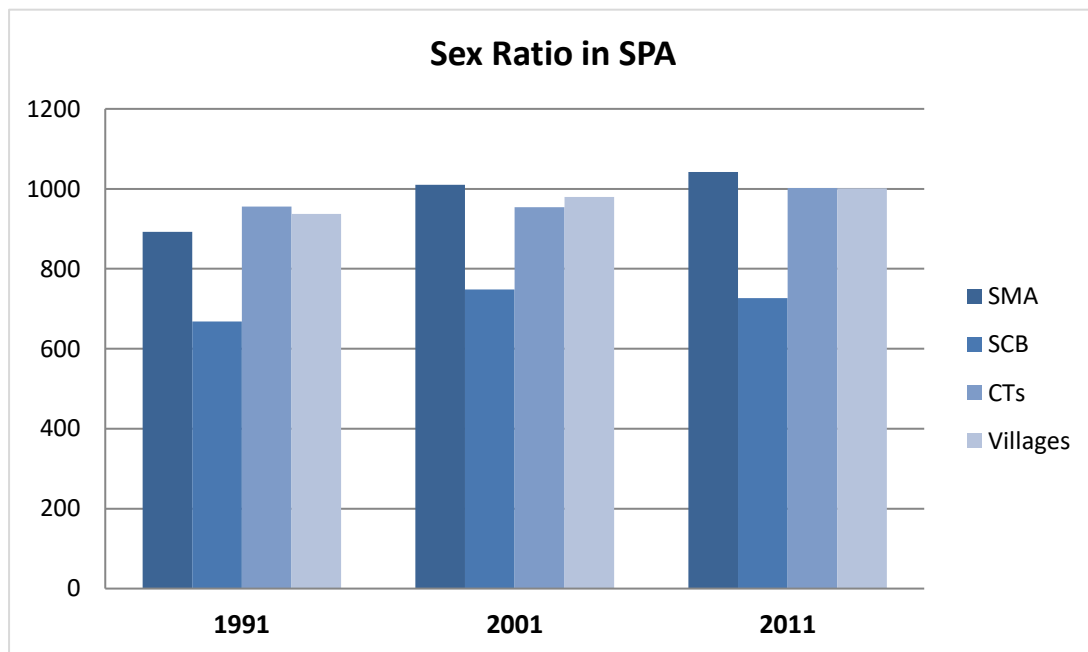


Figure 2-5: Sex Ratio in SPA



## 2.7 LITERACY RATE

The literacy rate of Shillong Planning Area is 90.06% and the crude literacy rate is 78.58% according to Census 2011. The literacy rate is the total number of literate people in a place at a given age group by the total number of people in the given age group. We have considered the age group from 7 years and above. Crude literacy rate is the given number of literate people by the total population of the area. The literacy rate of Shillong Planning Area is much higher than the national and state average at present. The concerned region has been maintaining a decently good literacy rate since 1991. The literacy rate of Meghalaya has improved significantly since 1991 as shown in *Table 2-7*.

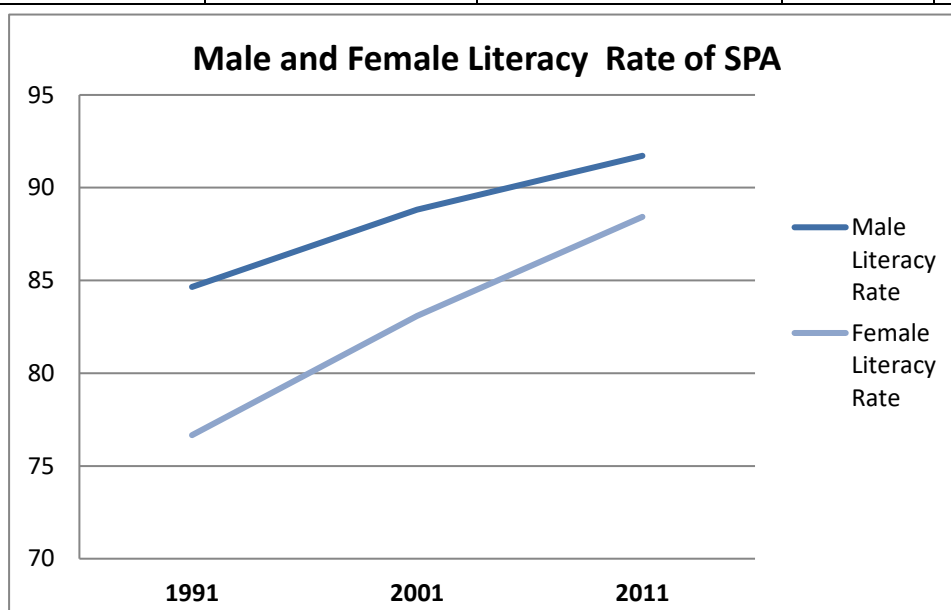
**Table 2-7: Comparative Literacy Rate**

Year	India	Meghalaya	Shillong Planning Area (SPA)	
			Literacy Rate	Crude Literacy Rate
1991	42.84	31.48	80.87	67.68
2001	54.51	62.56	85.87	74.05
2011	64.32	74.43	90.06	78.58

The literacy rate composition of Shillong Planning Area for 2011 is given below. The literacy rate of the citizens in Shillong Municipal Area is the highest followed by the populates of the census town as shown in *Table 2-8*. The locals of the villages also have a very high literacy rate compared to the national and state average. The male literacy of rate is more than the female literacy rate of Shillong Planning Area but the gap is getting closer.

**Table 2-8: Literacy Rate in SPA (2011)**

	Shillong Municipal Area	Shillong Cantonment Area	Census Towns	Villages
<b>Literacy Rate</b>	92.81	85.65	90.65	82.61
<b>Crude Literacy Rate</b>	83.53	77	78.69	67.87



**Figure 2-6: Male and Female Literacy Rate of SPA**

## 2.8 SCHEDULE TRIBE POPULATION

According to Census 2011, Shillong Planning area has a Schedule Tribe composition of 64.20% of the total population. Meghalaya being a tribal state, it is expected to have a high ST population composition. The percentage of the ST population is gradually increasing over the decades.

Since 97% of Meghalaya is listed as a 6<sup>th</sup> schedule state. The European Wards of Shillong Municipal Area and Cantonment Area are excluded from the sixth schedule; hence, they have the non-tribal residents in the area. Cantonment Board is home to army soldiers from all across India; hence, it has the lowest ST population. The Municipal Area has a more or less balanced tendency in the two compositions, although census towns and villages in the sixth schedule region have a high ST population composition (*Table 2-9*).

Table 2-9: Percentage of ST population in SPA

Year	1991	2001	2011
% of ST population	57%	61%	64%

## 2.9 SCHEDULE CASTE POPULATION

The schedule cast population of the Shillong Planning Area is very less. According to Census of 2011, the total population composition of schedule tribe population in SPA is only 0.66% of the total population.

Form *Figure 2-7*, the highest concentration of schedule cast population is seen in the Cantonment Board mostly working in the military and posted in Shillong. The census towns and the villages have almost negligible SC population. There are many villages with zero SC population. This is because the non-tribal populations in the sixth schedule areas are very less and SC community forms even a smaller part of it. Shillong Municipal Board has slightly higher SC composition than the villages and Census Towns.

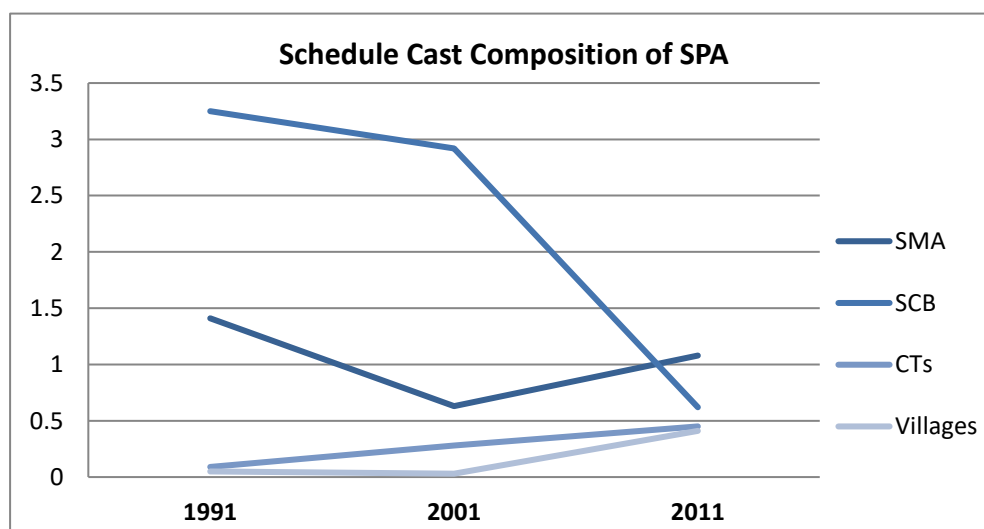


Figure 2-7: Schedule Cast Composition of SPA

## 2.10 WORK FORCE PARTICIPATION RATE (WFPR)

Shillong Planning Area has an overall Work Force Participation Rate of 42.79%. The work force participation rate is calculated by taking the total number of workers by the total population from 7 years and above. The work force participation rate of Shillong Municipal Area, Shillong Cantonment Board, the consolidate census towns and consolidated villages are given in *Table 2-10*.

Table 2-10: WFPR of SPA

	SMA	SCB	CTs	Villages
WFPR	42.52	44.83	41.83	46.12

## 2.11 POPULATION PROJECTION

The exercise of Population projection is carried out mainly to come up with an estimate of how many people to plan for in the targeted area. This process is mathematically carried out, using different methods depending upon the past growth trend. This projection gives us a tentative number of populations for the targeted year and likewise services could be planned out the extra people efficiently. For the Master Plan of 2041, our target year for population projection is also 2041. We have also projected the population till 2051 to keep the infrastructure and services planning flexible.

### 2.11.1 METHODS OF POPULATION PROJECTION

There are different methods of population forecasting and each method gives a different value depending upon their respective formulas. Population projection has been done for the year 2011 using three different methods viz., Arithmetic Progression, Geometric Progression and Incremental Increase method. The data from 1971 to 2001 have been used to find the growth rate and population has been projected for 2011. The values given by the different methods were then compared to the existing 2011 population number to find out which method gave the closest value to the existing value.

By Arithmetical Progression method, it is assumed that population is increasing at a constant rate. Hence,  $dP/dt = C$  i.e., rate of change in population with respect to time is constant. Therefore, population after  $n^{\text{th}}$  decade will be

$$P_n = P + n.C$$

Where, ' $P_n$ ' is the population after ' $n$ ' decades and ' $P$ ' is present population.

In Geometric Progression Method, the percentage in population from decade to decade is assumed to remain constant. Geometric mean increase is used to find out the future increment in population. The population at the end of  $n^{\text{th}}$  decade ' $P_n$ ' can be estimated as:

$$P_n = P(1 + IG/100)^n$$

Where, 'IG' is the geometric mean (%), 'P' Present population and 'N' no. of decades.

Incremental Increase Method is a modification of arithmetical increase method. The incremental increase is determined for each decade from the past population and the average value is added to the present population along with the average rate of increase. Hence, population after n<sup>th</sup> decade is

$$P_n = P + n.X + \{n(n+1)/2\}.Y$$

Where, 'P<sub>n</sub>' Population after n<sup>th</sup> decade, 'X' Average increase and 'Y' Incremental increase.

After comparing all the different values projected for the year 2011 (Table 2-11), it was found that Arithmetic Progression Method gave the closest value to the realistic value of the year 2011.

Table 2-11: Comparison of different methods of populated projection for 2011

2011 Realistic Value	Arithmetic Progression	Geometric Progression	Incremental Increase
421377	407900	459665	394179

The difference between the existing population of 2011 according to Census of India and the value projected for 2011 using Arithmetic Progression is 13,477 that are much lesser than the difference between the values received using Geometric Progression and Incremental Increase Method, which are 38,288 and 27,198 respectively. Hence, Arithmetic Progression Method has been chosen to do the future population forecasting for the year 2021, 2031, 2041 and 2051 as represented in Table 2-12 and Figure 2-8.

Table 2-12: Comparison of different methods of populated projection for 2041

Year	Arithmetic Progression Method	Geometrical Progression Method	Incremental Increase Method
2021	496033	559278	492022
2031	570690	742310	558655
2041	645346	985241	621276
2051	720002	1307675	679885

## 2.12 FUTURE URBANIZATION

In the planning area, seven villages that will cross the population of 5000 person in 2041 as per the population projection, all the villages will also cross the density of more than 400 person/km<sup>2</sup> completing the second criteria.

The percentage of the current male main workers in non-agricultural sector has been taken out to see which all villages already complete the third criteria of more than 75% of male main workers non-agricultural workers. At present, all villages except Mawtawar, Lapalang and Umshing complete the criteria but this is based on the present data according to Census

2011. Hence, there is a possibility that by 2041, all the villages will have more than 75% of its male main workers in the non-agricultural sector and all the villages will qualify to become census town (Table 2-13).

Table 2-13: Villages with the Potential of Being Urbanised By 2041

Village	Population in 2041	Density in 2041	% of Male main non-agricultural workers (2011)
Laitkor	18053	2659.41	88.12%
Lapalang	10579	5995.18	71.64 %
Umshing	5303	1714.59	72.15%
Mawnianglah	6876	8329.29	88.08%
Mawtawar	5113	537.8	58.25%
Nongrah	12803	893.21	97.32%
Nongsder	5038	2189.34	82.64%

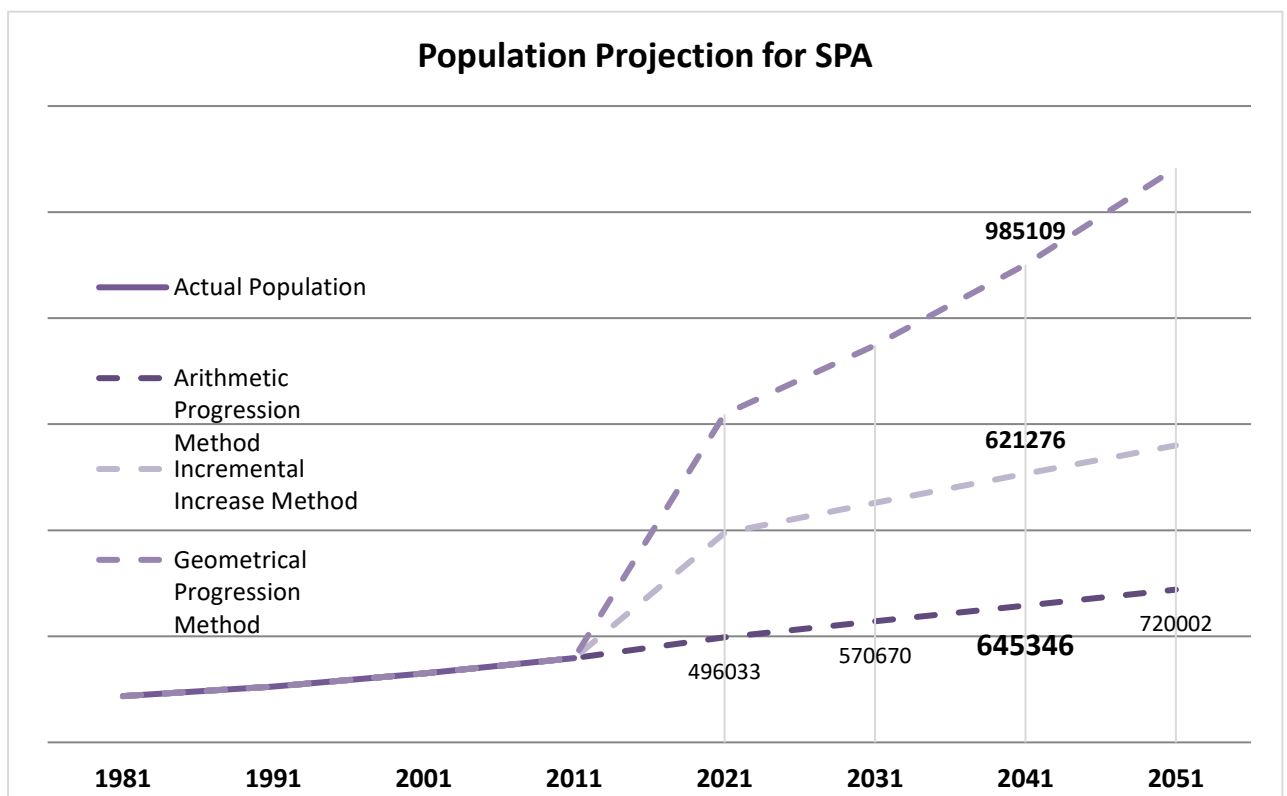


Figure 2-8: Population Projection for SPA



### 3 URBAN LAND USE

#### 3.1 SHILLONG PLANNING AREA AT PRESENT

##### 3.1.1 LAND UTILIZATION

Development in Shillong Planning Area (SPA) has been constrained by terrain suitability and forest area. While 18.2% of the total area is already developed (52.63km<sup>2</sup>) out of the total planning area (288.5km<sup>2</sup>), abundance of hills, Wet lands, water bodies, Eco sensitive and forest areas has limited the developable area to only 16.2%.

Table 3-1: Land Utilization of SPA (2022)

SNo	Land Utilization	Area(Sqkm)	Percentage
1	Agriculture	47.46	16.4
2	Developable Area	46.63	16.2
3	Developed Area	52.63	18.2
4	Forest Area	19.11	6.6
5	Tree Clad Area	34.45	11.9
6	Dense Area	74.66	25.9
7	Unclassified	7.57	2.6
8	Water Sheet	3.29	1.1
9	Slope>45	2.71	0.9
<b>TOTAL PLANNING AREA</b>		<b>288.51</b>	<b>100</b>

Around 2.71km<sup>2</sup> of the total planning area is unsuitable for any developmental activity having a slope of 45 degrees and above and has attributed to around 0.9% of the available land. Coherently devising the Land utilization, certain parcels of land has been positioned as developable pertaining to tree clad area, where canopy cover is lesser than 70% and clusters of vegetation having area coverage lesser than 50 hectares (Table3-1).

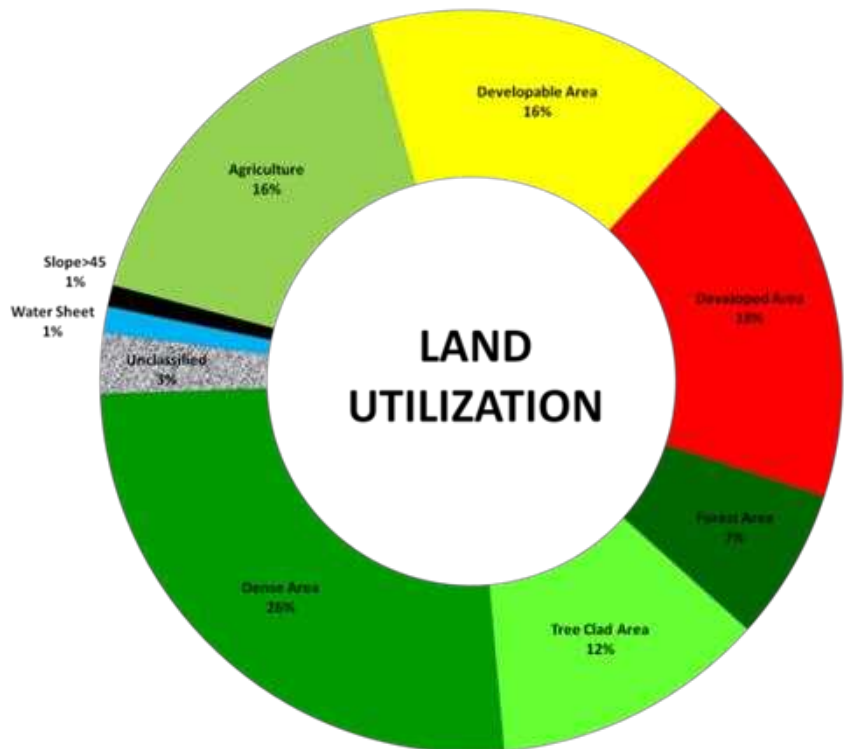


Figure 3-1: Area Statistics for Land Utilization of SPA (2022)





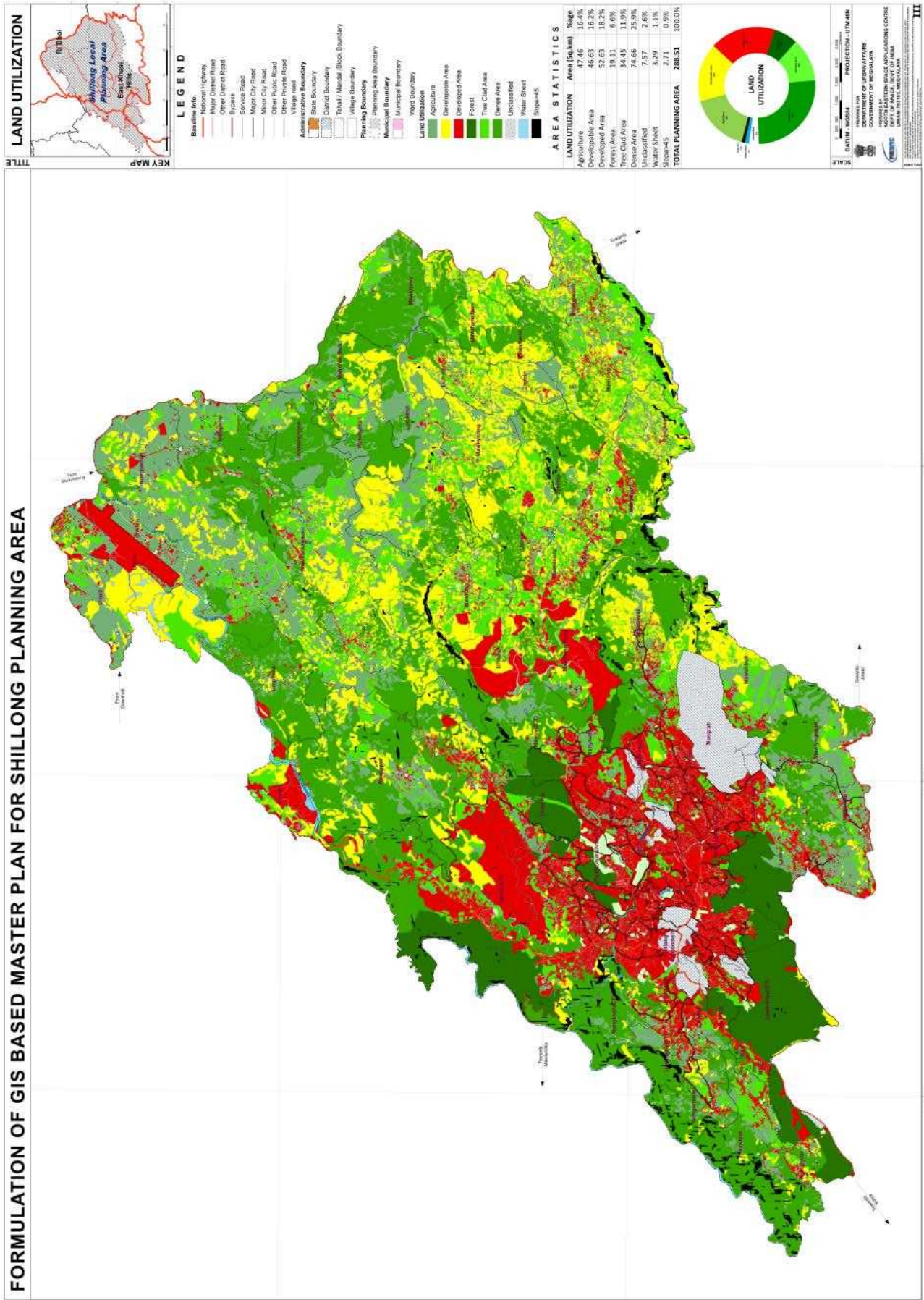


Figure 3-2: Land Utilization of SPA

### 3.2 EXISTING LAND-USE (2022)

The land use distribution of Shillong indicates its administrative and educational standpoint as well as the presence of Defence Establishment in the city. While residential areas take away nearly 29.7% of the total developed land, mixed land use comprises of 2.5% of the developed area. Areas under Administrative, Institutional, and Public & Semi-public use account for 8.2% of land. 14.3% of the area comes under circulation (Transportation & traffic related) which is indicative of the hilly terrain of Shillong Planning Area (Table3-2). Though, the land use for circulation appears to be significant as per the Master Plan, it is in fact, inadequate as is evident from narrow roads, areas without vehicular roads and missing links.

Table 3-2: Existing Urban Land Use (2022) of SPA

SNo	Categories	Area (Sqkm)	%age of Developed area
1	Residential	15.66	29.75
2	Commercial	1.31	2.48
3	Industrial	1.21	2.3
4	Mixed	1.32	2.5
5	Educational	6.52	12.38
6	Health Services	1.61	3.07
7	Central Govt. Property	0.55	1.05
8	State Govt. Property	1.94	3.68
10	Public& Semi-public	1.84	3.49
11	Religious	0.48	0.91
12	Recreational	1.53	2.91
13	Public Utilities	0.18	0.34
14	Solid Waste Management	0.07	0.13
15	Communication	0.02	0.04
16	Heritage	0	0
17	Slum	0.03	0.05
18	Vacant Land	5.8	11.02
19	Transportation	7.45	14.16
20	Traffic related	0.07	0.14
21	Rural	2.97	5.63
22	Misc.	2.09	3.97
<b>Total Developed Area</b>		<b>52.6</b>	<b>100</b>

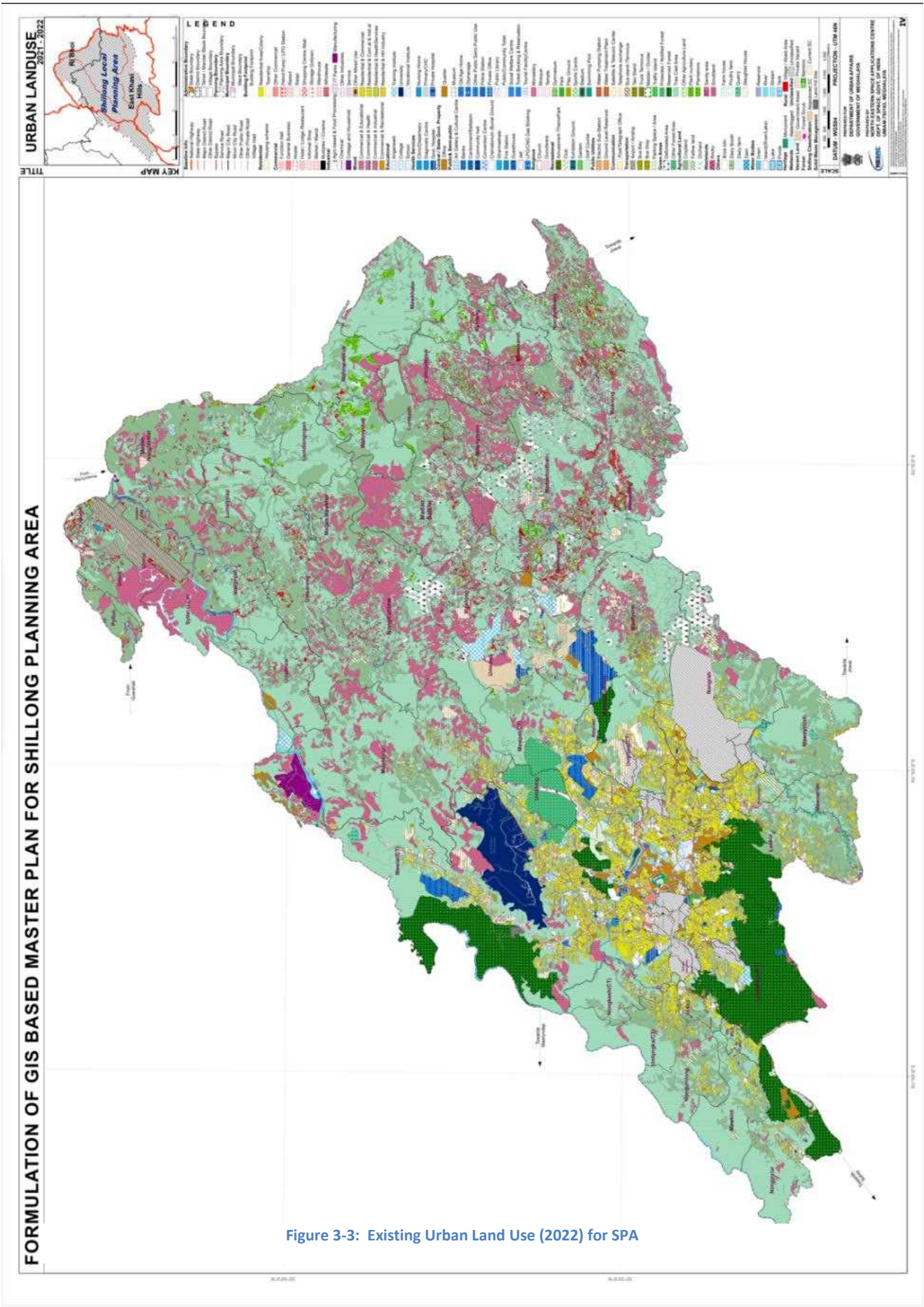


Figure 3-3: Existing Urban Land Use (2022) for SPA

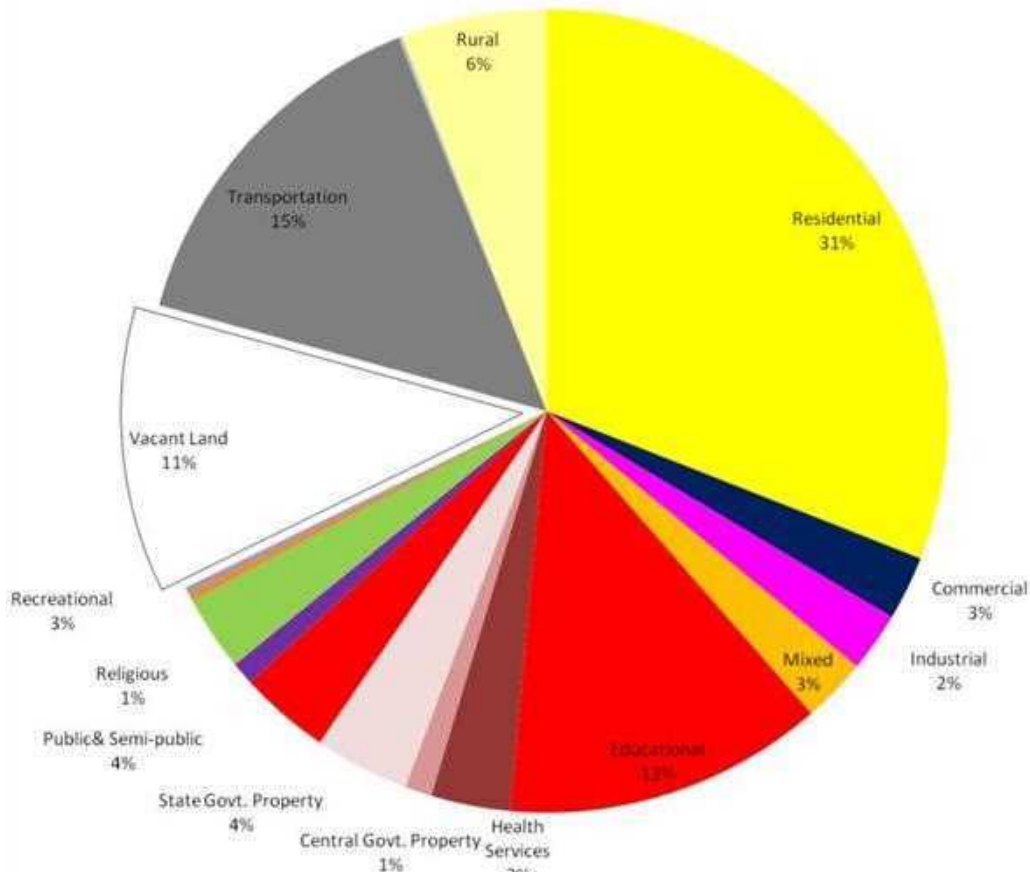


Figure 3-4: Distribution of Existing Urban Land Use(2022) of SPA

### 3.3 PLANNING DISTRICTS WISE URBAN LAND USE

The planning area is in different stages of development, including a core region, several growing Census Town Areas, and a number of spot developments in the rural or the peripheral regions. To better comprehend existing urban land use, the SPA has been divided into 45 Planning Districts (PD). **All units in this section are in hectares and enlarged maps in Annexure-I.**

The PD's are demarked based on the administrative boundaries i.e., in the core area with respect to ward boundaries here as in rest via village boundaries<sup>1</sup> (Table 3-3).

Table 3-3: Planning District based on Administrative Boundary

Administrative Boundary	PD No	Name	Area(Ha)
Ward Boundary	1	Police Bazar	12.30
	2	Jail Road	99.66
	3	European Ward	148.97
	4	Laitumkhrah	189.41
	5	Malki	73.20

<sup>1</sup> Imaginary administrative boundaries and other relevant sources are indicative, and are provided to establish relative location of various plan elements.

Administrative Boundary	PD No	Name	Area(Ha)
Village Boundary	6	Laitkor	711.84
Ward Boundary	7	Lumparing	156.22
	8	Laban	35.11
	9	Kench's Trace	69.47
Village Boundary	10	Shillong Cantonment	192.77
	11	Lummawbah	79.32
Ward Boundary	12	Mawprem	116.12
	13	S.E. Mawkhar	33.28
	14	Jaiaw	60.05
	15	Mawkhar	29.56
Village Boundary	16	Pynthormukhrah(CT)	276.33
	17	Nongmynsong(CT)	139.51
	18	Nongthymmai(CT)	326.78
	19	Lawsotun(CT)	630.33
	20	5th MILE	225.01
	21	Nongpyiur	607.19
	22	Mawklot	747.24
	23	Umlingka(CT)	391.27
	24	Nongkseh(CT)	257.80
	25	Mawlai(CT)	2546.52
	26	Mawpat(CT)	888.35
	27	Umpling(CT)	444.82
	28	Madanriting(CT)	190.84
	29	Mawtawar	1666.72
	30	Nongkohlew	1283.63
	31	Umsawli	733.72
	32	Mawdiangdiang	627.03
	33	Mawlynrei	844.95
	34	Nongrah	1095.52
	35	Mawpynthih	774.89
	36	Umiam	736.93
	37	Umsarang	1031.03
	38	Saisiej	960.38
	39	Mawpdang	1843.90
	40	Umroi	1125.23
	41	Lumshyiap	775.80
	42	Nonglakhiat	1007.00
	43	Lumdiengngan	1462.69
	44	Lumdiengsai	1541.01
	45	Nongtyrkhang	1661.53

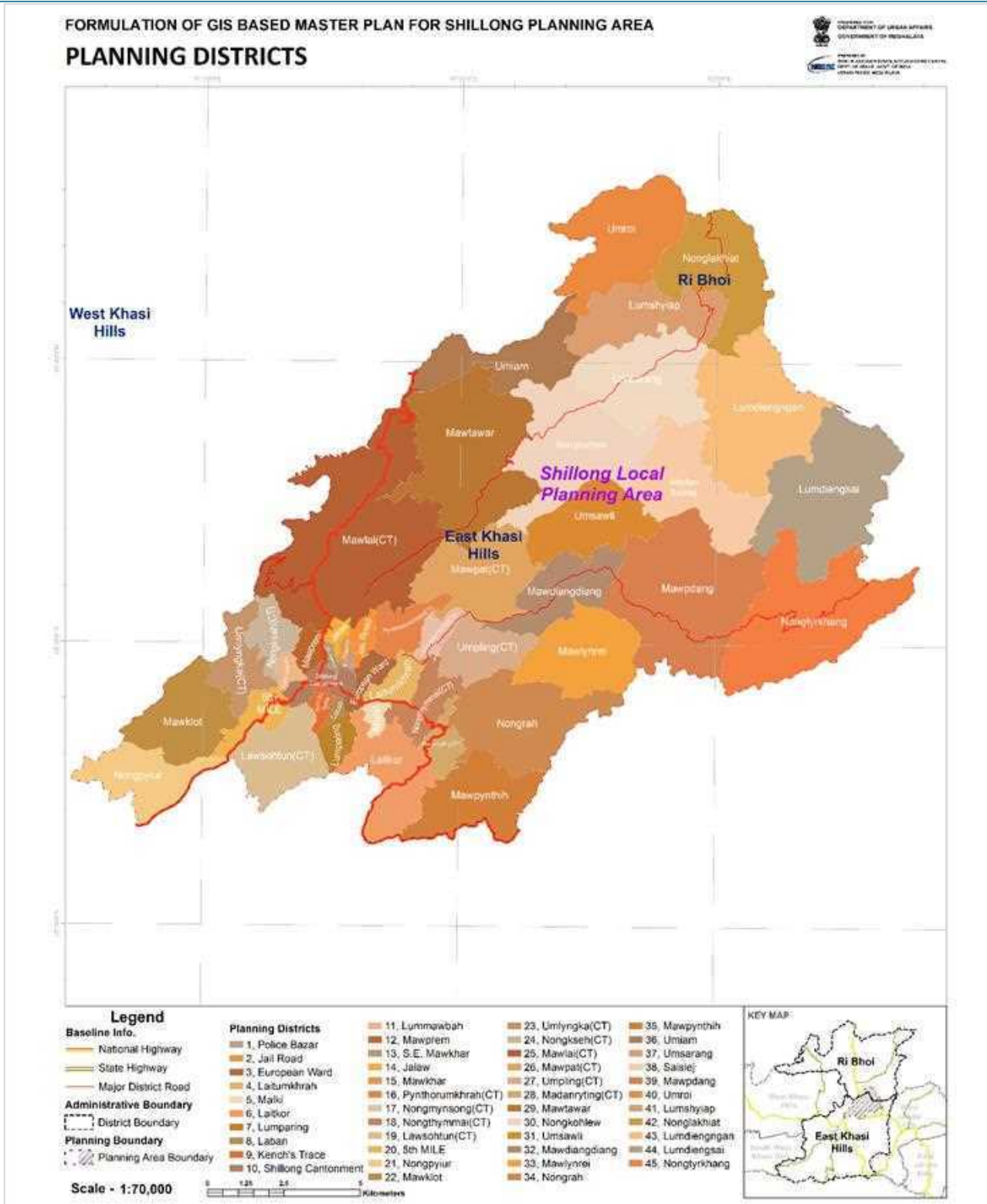


Figure 3-5: Planning Districts based on Admin Boundary

### 3.3.1 PLANNING DISTRICT NO.1 – POLICE BAZAR

**Area:** 12.30 Hectares

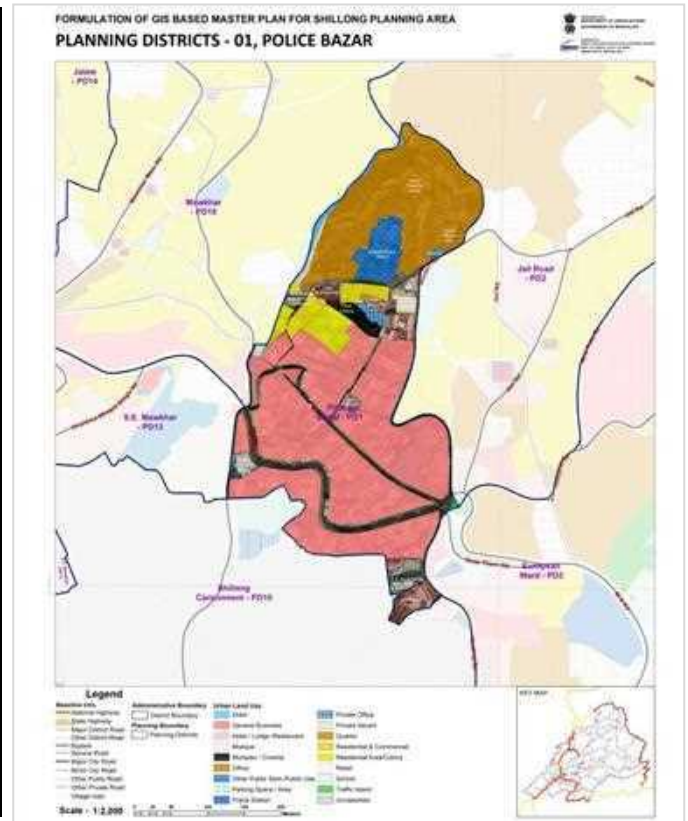
**Location:** Within the core area

**Major Landmarks:** Jama Masjid, Ramakrishna Mission School, Saddar Police Station, Payal Cinema (Figure 3-6).

**Table 3-4: Existing ULU - PD01 - Police Bazar**

Police Bazar - Categories	Area(Ha)	%age
Drain	0.09	0.74
General Business	5.87	47.70
Hotel / Lodge /Restaurant	0.48	3.86
Mosque	0.05	0.39
Multiplex / Cinema	0.13	1.09
Office	0.06	0.52
Other Public Semi-Public Use	0.02	0.13
Police Station	0.43	3.46
Private Office	0.06	0.47
Private Vacant	0.13	1.04
Quarter	2.61	21.25
Residential & Commercial	0.30	2.42
Residential Area/Colony	0.33	2.67
Retail	0.09	0.74
School	0.34	2.75
Traffic and Transportation	1.32	10.76
Tree Clad Area	0.00	0.00
Unclassified	0.00	0.03
<b>Grand Total</b>	<b>12.30</b>	<b>100.00</b>

**Figure 3-6: Planning District – 01 - Police Bazar**



**General Description about the planning district:** The planning district has the highest concentration of area is General Business, which occupies 47.7% of the total area, followed by Traffic and Transportation at 10.8%, and Residential/Quarter at 23.9%. Tree Clad Area, on the other hand, has the smallest area at 0.007% (Table 3-4).

### 3.3.2 PLANNING DISTRICT NO.2 – JAIL ROAD

**Area:** 100.21 Hectares

**Location:** Within the core area

**Major Landmarks:** Central Medical Store, District Jail, Marriott Hotel, Vishal Mega Mart, Meghalaya Tourist Information Centre, FCI FSD, Meghalaya Transport Corporation, Ganesh Das Hospital, Polo Towers, NIFT, Ramakrishna Mission Vivekananda Cultural Centre, MIMHANS, District Commerce & Industries Centre (Figure3-7).

**Table 3-5: Existing ULU - PD02 - Jail Road**

Jail Road - Categories	Area(Ha)	%age	Jail Road - Categories	Area(Ha)	%age
Agro based & Food Processing	2.16	2.15	Office	7.39	7.38
Banks	0.06	0.06	Other Commercial	0.08	0.08
Cantonment/Battalion	2.43	2.43	Other Mixed Use	0.39	0.39
Church	0.02	0.02	Other Public Semi-P Use	0.00	0.00
Clinic/Dispensary	0.15	0.15	Park	0.10	0.10

Commercial & Industrial	0.07	0.07	Petrol Pump / LPG Filling Station	0.06	0.06
Community hall	0.21	0.21	Police Station	0.03	0.03
Crematorium /Burial Ground /Grave Yard	7.32	7.31	Ponds	0.02	0.02
Cropland	0.01	0.01	Private Vacant	0.81	0.81
Diagnostic Centre	0.10	0.10	Quarter	11.29	11.27
Drain	0.03	0.03	Reserved Forest	19.21	19.17
Function Hall / Marriage Garden	0.09	0.09	Residential & Commercial	1.70	1.70
General Business	1.61	1.61	Residential Area/Colony	15.45	15.42
Government Asset	0.22	0.22	Retail	0.10	0.10
Govt. Hospital	4.03	4.03	School	1.73	1.72
Ground Level Reservoir	0.02	0.02	Shopping Centre /Mall	0.08	0.08
Guesthouse	0.24	0.24	Storage Godown	1.12	1.12
Hotel / Lodge /Restaurant	1.02	1.02	Stream	1.61	1.61
IT Parks	0.50	0.49	Temple	0.07	0.07
Jail	1.38	1.37	Traffic and Transportation	8.80	8.78
Market (Daily & Weekly) / Mandi	0.02	0.02	Training Institute	4.31	4.31
Monastery	0.27	0.26	Tree Clad Area	3.90	3.89
			<b>Grand Total</b>	<b>100.21</b>	<b>100.00</b>

### General Description about the planning district:

The planning district has the top hold of 19.17% the total land area is designated as Reserved Forest, followed by Residential Area/Colony (15.42%), 11.27% Quarter (State/Central) and 7.38% is occupied by Offices (Table 3-5).

Some of the land use categories include Traffic and Transportation (8.77%), and Tree Clad Area (3.89%). These values suggest that the Jail Road area is a mix of residential, commercial, and natural areas. Additionally, some areas are designated for specific purposes, such as the Jail (1.37%) and Government Hospital (4.03%).

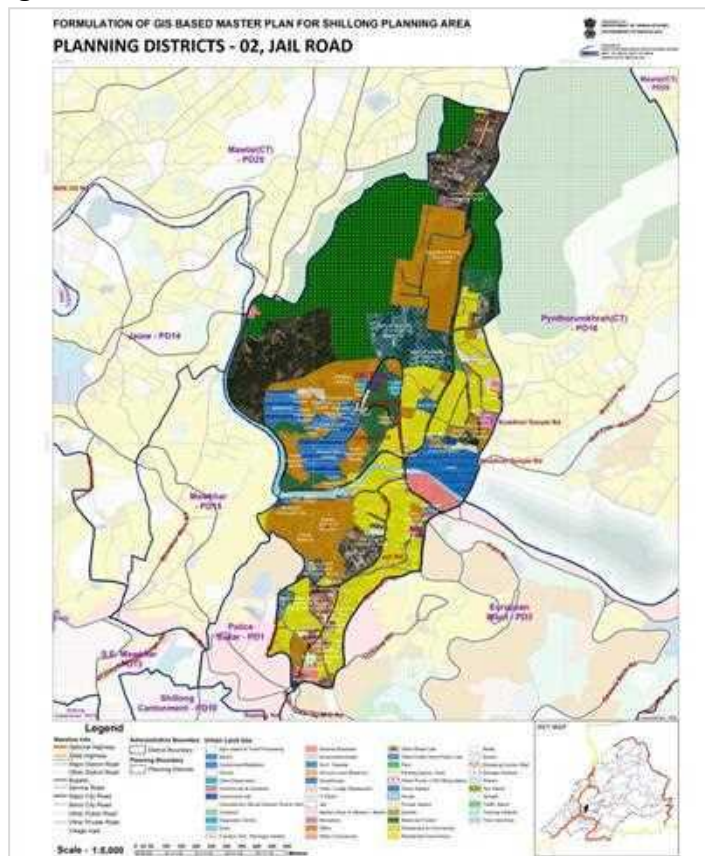


Figure 3-7: Planning District – 02 - Jail Road



### 3.3.3 PLANNING DISTRICT NO.3 – EUROPEAN WARD

**Area:** 148.97 Hectares

**Location:** Within the core area

**Major Landmarks:** All Saint's Cathedral, IGP Point, NECTAR, Passport Seva Kendra, CMJ University, General Post Office, Meghalaya High Court, Meghalaya Public Service Commission, Civil Hospital Shillong, Raj Bhavan, Shillong Club, State Central Library, Ward's Lake (Figure 3-8).

**General Description about the planning district:** The most common land use category is Quarter, accounting for 22.77% of the total land area, followed by Office (14.02%), Traffic and Transportation (10.72%), and Residential Area/Colony (9.41%). Other significant land use

categories include Tree Clad Area (8.81%), Park (5.51%), and General Business (2.25%). The least common land use categories include Ticket Booking & Reservation Office, Tourist Facility Centre, and Social Welfare Centre, each accounting for <0.1% of the land area (Table 3-6) .

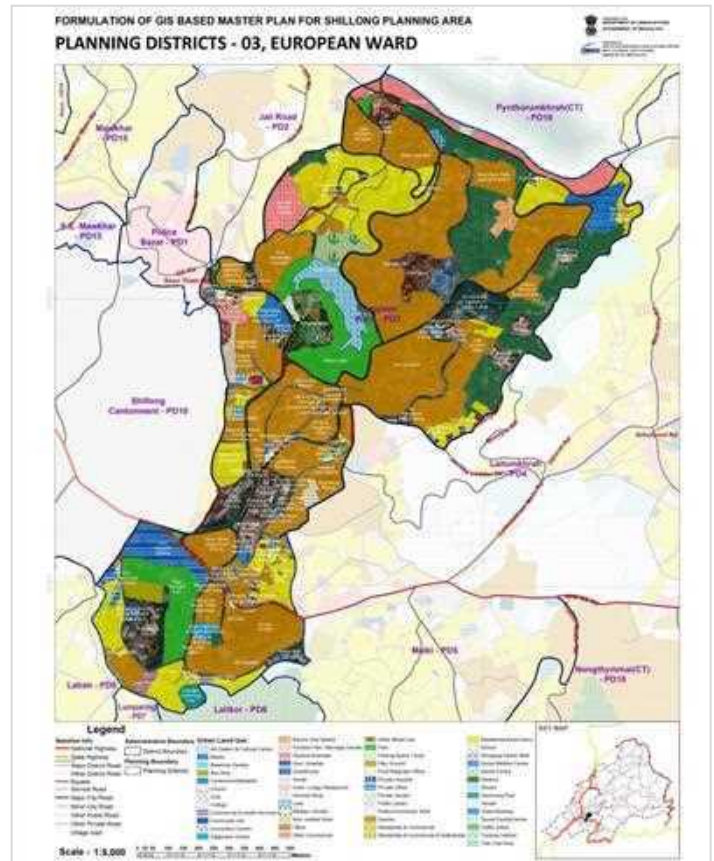


Figure 3-8: Planning District – 03 - European Ward

Table 3-6: Existing ULU - PD03 - European Ward

European Ward - Categories	Area(Ha)	%age
Art Gallery & Cultural Centre	1.95	1.31
Banks	0.83	0.56
Botanical Garden	1.37	0.92
Cantonment/Battalion	1.49	1.00
Church	1.66	1.11
Club	2.16	1.45
College	1.18	0.79
Commercial & Health Services	0.34	0.23
Community hall	0.03	0.02
Convention Centre	0.86	0.58
Diagnostic Centre	0.24	0.16
Electric Sub-Station	0.70	0.47

European Ward - Categories	Area(Ha)	%age
Play Ground	0.78	0.53
Post/Telegraph Office	0.68	0.45
Private Hospital	0.19	0.13
Private Office	0.74	0.50
Private Vacant	0.55	0.37
Public Library	1.54	1.03
Public/Community Toilet	0.02	0.01
Quarter	33.91	22.77
Residential & Commercial	3.74	2.51
Residential & Commercial & Institutional	0.04	0.03
Residential Area/Colony	14.01	9.41
School	4.42	2.97

Function Hall / Marriage Gard	0.17	0.12
General Business	3.35	2.25
Govt. Hospital	2.54	1.70
Guesthouse	0.10	0.07
Hostel	0.41	0.28
Hotel / Lodge /Restaurant	3.19	2.14
Informal Shop	0.01	0.01
Lake	2.32	1.56
Non- notified Slum	0.58	0.39
Office	20.89	14.02
Other Commercial	1.74	1.16
Other Mixed Use	0.38	0.25
Park	8.21	5.51

Shopping Centre /Mall	0.23	0.15
Social Welfare Centre	0.03	0.02
Sports Centre	0.27	0.18
Stadium	0.23	0.15
Stream	0.86	0.58
Swimming Pool	0.48	0.32
Temple	0.14	0.10
Ticket Booking & Reservation Office	0.00	0.00
Tourist Facility Centre	0.00	0.00
Traffic and Transportation	15.97	10.72
Training Institute	0.29	0.19
Tree Clad Area	13.12	8.81
<b>Grand Total</b>	<b>148.97</b>	<b>100.00</b>

### 3.3.4 PLANNING DISTRICT NO.4 – LAITUMKHRAH

**Area:** 189.72 Hectares

**Location:** Within the core area

**Major Landmarks:** All India Radio, Cathedral Church, Nazareth Hospital, Guru Singh Sabha Gurudwara, National Institute of Technology, St Edmund's, Fire Bridge Junction, DonBosco Square and St. Anthony's College (*Figure 3-9*).

**General Description about the planning district:** The dominant land use category in the area is residential, which accounts for 32.95% of the total land use. Other significant land use categories include schools (12.64%), colleges (5.53%), private vacant (2.26%), training institutes (2.91%), general business (4.98%), and office space (5.25%). The area also has significant religious infrastructure such as churches (2.41%), crematoriums/burial grounds/graveyards (2.06%), and temples (0.03%). The traffic and transportation infrastructure account for 8.94% of the total land use, while tree-clad areas make up 4.51% of the land use (*Table 3-7*).

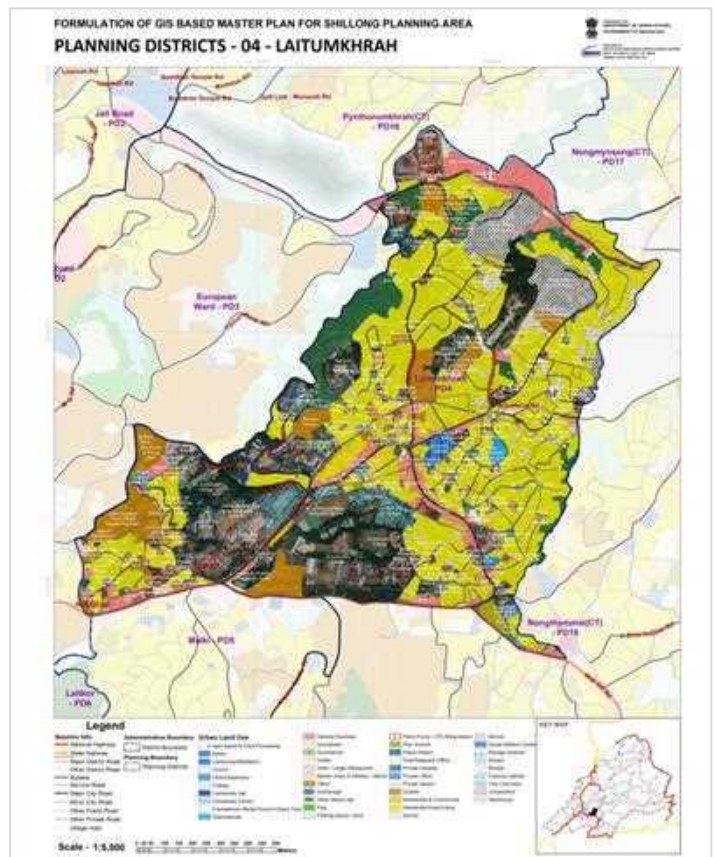


Figure 3-9: Planning District – 04 – Laitumkhrah

Table 3-7: Existing ULU - PD04 - Laitumkrah

Laitumkrah - Categories	Area(Ha)	%age
Agro based & Food Processing	0.20	0.11
Banks	0.10	0.05
Cantonment/Battalion	0.02	0.01
Church	4.57	2.41
Clinic/Dispensary	0.18	0.10
College	10.49	5.53
Community hall	0.02	0.01
Convention Centre	0.08	0.04
Crematorium /Burial Ground /Grave Yard	3.90	2.06
Dharmashala	0.39	0.20
General Business	9.45	4.98
Gurudwara	0.23	0.12
Gymnasium	0.08	0.04
Hostel	1.84	0.97
Hotel / Lodge /Restaurant	3.29	1.73
Market (Daily & Weekly) / Mandi	0.33	0.17
Office	9.95	5.25
Orphanage	0.06	0.03
Other Mixed Use	0.16	0.08
Park	0.08	0.04
Petrol Pump / LPG Filling Station	0.17	0.09

Laitumkrah - Categories	Area(Ha)	%age
Play Ground	0.67	0.36
Police Station	0.07	0.03
Post/Telegraph Office	0.13	0.07
Private Hospital	0.95	0.50
Private Office	0.72	0.38
Private Vacant	4.29	2.26
Quarter	2.91	1.54
Residential & Commercial	5.39	2.84
Residential Area/Colony	62.52	32.95
School	23.99	12.64
Service	0.70	0.37
Social Welfare Centre	0.09	0.05
Storage Godown	0.91	0.48
Stream	0.76	0.40
Temple	0.06	0.03
Traffic and Transportation	16.96	8.94
Training Institute	5.51	2.91
Tree Clad Area	8.55	4.51
Unclassified	8.24	4.34
Warehouse	9.47	4.99
<b>Grand Total</b>	<b>189.72</b>	<b>100</b>

### 3.3.5 PLANNING DISTRICT NO.5 – MALKI

**Area:** 73.72 Hectares

**Location:** Within the core area

**Major Landmarks:** Woodland Hospital, Shillong Law College, Mizoram and Arunachal Circuit houses, Directorate of Horticulture (Figure 3-10).

**General Description about the planning district:** The Table 3-8 shows the land use pattern in the Malki area. The major land use categories are residential area/colony (41.48%), reserved forest (17.72%), office (6.08%), hotel/lodge/restaurant (4.51%), private vacant land (3.03%), quarter (2.84%),

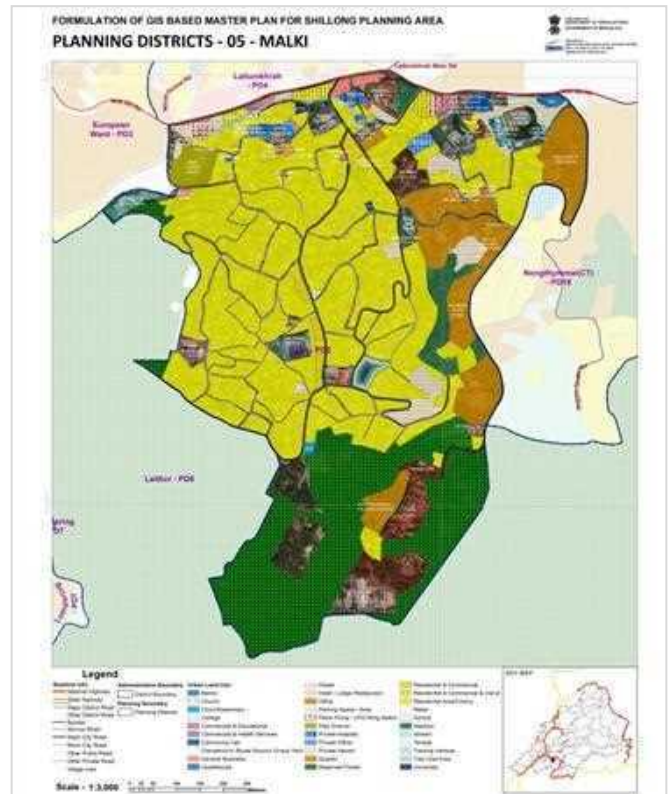


Figure 3-10: Planning District – 05 - Malki

school (2.64%), traffic and transportation (7.96%), and others. The other categories include various land uses such as banks, church, clinic/dispensary, commercial and educational, commercial and health services, community hall, crematorium/burial ground/graveyard, general business, guesthouse, hostel, petrol pump/LPG filling station, playground, private hospital, private office, retail, stadium, stream, temple, training institute, tree-clad area, and university.

Table 3-8: Existing ULU - PD05 - Malki

Malki - Categories	Area(Ha)	%age	Malki - Categories	Area(Ha)	%age
Banks	0.20	0.27	Private Office	0.23	0.31
Church	1.35	1.84	Private Vacant	2.23	3.03
Clinic/Dispensary	0.06	0.08	Quarter	2.09	2.84
College	0.39	0.52	Reserved Forest	13.06	17.72
Commercial & Educational	0.11	0.16	Residential & Commercial	0.78	1.06
Commercial & Health Services	0.05	0.07	Residential & Commercial & Institutional	0.51	0.69
Community hall	0.18	0.25	Residential Area/Colony	30.58	41.48
Crematorium /Burial Ground /Grave Yard	1.58	2.15	Retail	0.11	0.15
General Business	0.31	0.43	School	1.94	2.64
Guesthouse	0.13	0.18	Stadium	0.31	0.42
Hostel	0.11	0.16	Stream	0.19	0.26
Hotel / Lodge /Restaurant	3.33	4.51	Temple	0.16	0.21
Office	4.48	6.08	Traffic and Transportation	5.87	7.96
Petrol Pump / LPG Filling Station	0.23	0.32	Training Institute	0.66	0.90
Play Ground	0.70	0.95	Tree Clad Area	1.50	2.04
Private Hospital	0.18	0.24	University	0.08	0.11
			<b>Grand Total</b>	<b>73.72</b>	<b>100</b>

### 3.3.6 PLANNING DISTRICT NO.6 – LAITKOR

**Area:** 711.88 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** Air Force, Laitkor Presbyterian School, St. Joseph Sec. School Laitkor, Reserved Forest Area (*Figure 3-11*)..

**General Description about the planning district:** The dominant land-use category in Laitkor is reserved forest, which covers 38.76% of the area. The second most dominant land-use category is cropland at 26.81%. Other significant categories include tree-clad area (14.77%), residential area/colony (6.82%), traffic and transportation (3.17%), and quarry (2.83%) (*Table 3-9*).

Table 3-9: Existing ULU - PD06 – Laitkor

Laitkor - Categories	Area(Ha)	%age	Laitkor - Categories	Area(Ha)	%age
Anganwadi	0.04	0.01	Petrol Pump / LPG Filling Station	0.21	0.03
Brick kiln	1.47	0.21	Play Ground	1.97	0.28
Cantonment/Battalion	4.22	0.59	Private Office	0.03	0.00
Church	0.70	0.10	Private Vacant	10.09	1.42
Clinic/Dispensary	0.03	0.00	Public/Community Toilet	0.04	0.01
College	0.23	0.03	Quarry	20.18	2.83
Commercial & Industrial	1.50	0.21	Quarter	0.59	0.08
Crematorium / Grave Yard	1.26	0.18	Reserved Forest	275.93	38.76
Cropland	190.85	26.81	Residential & Commercial	3.05	0.43
Fallow land	0.34	0.05	Residential Area/Colony	48.58	6.82
Farm house	0.06	0.01	River	1.53	0.22
Function Hall / Marriage	0.48	0.07	School	2.04	0.29
General Business	1.95	0.27	Scrubland	2.97	0.42
Ground Level Reservoir	0.00	0.00	Service	9.54	1.34
Hotel / Lodge /Restaurant	0.02	0.00	Stream	0.11	0.02
Office	2.11	0.30	Traffic and Transportation	22.56	3.17
Other Industries	2.03	0.28	Tree Clad Area	105.14	14.77
Park	0.00	0.00	<b>Grand Total</b>	<b>711.87</b>	<b>100</b>

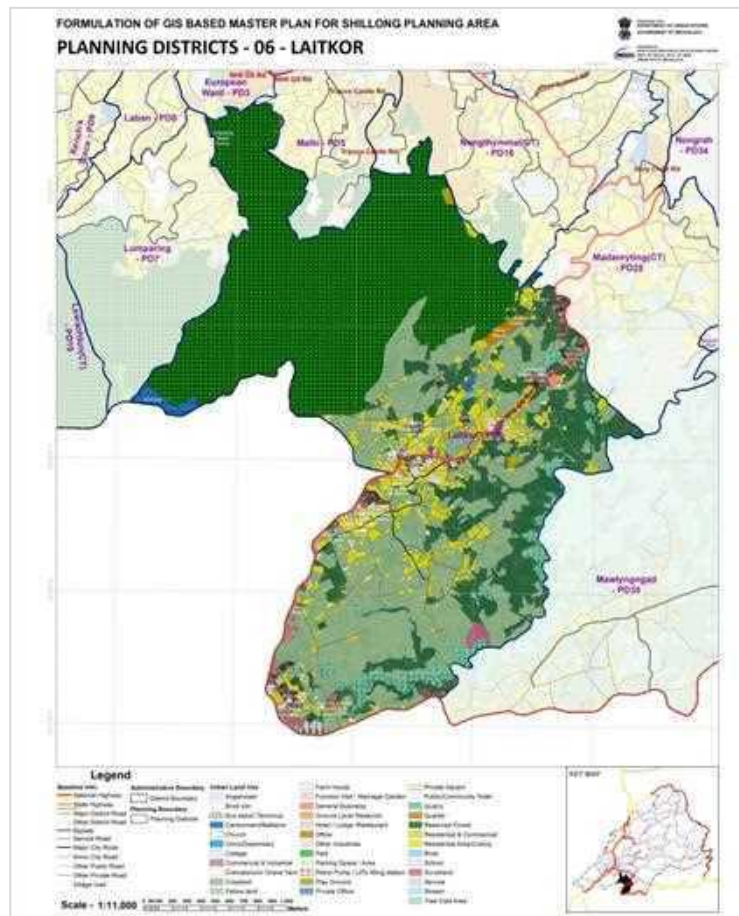


Figure 3-11: Planning District – 06 – Laitkor

### 3.3.7 PLANNING DISTRICT NO.7 – LUMPARING

**Area:** 156.22 Hectares

**Location:** Within the core area

**Major Landmarks:** Shillong View Point, Tibetan Buddhist Monastery, Raid Laban College (Figure 3-12).

**General Description about the planning district:** The major categories of land in Lumparing are Reserved Forest (48.87%), Residential Area/Colony (27.34%), and Traffic and Transportation (4.26%). Other notable categories include Crematorium/Burial Ground/Grave Yard (2.94%), Cropland (0.92%), and Play Ground (0.93%). It is interesting to note that Residential Area/Colony comprises a significant portion of the land in Lumparing, with 42.71 hectares or 27.34% of the total area. Additionally, Reserved Forest is also a significant category, covering 76.35 hectares or 48.87% of the total area (Table 3-10).

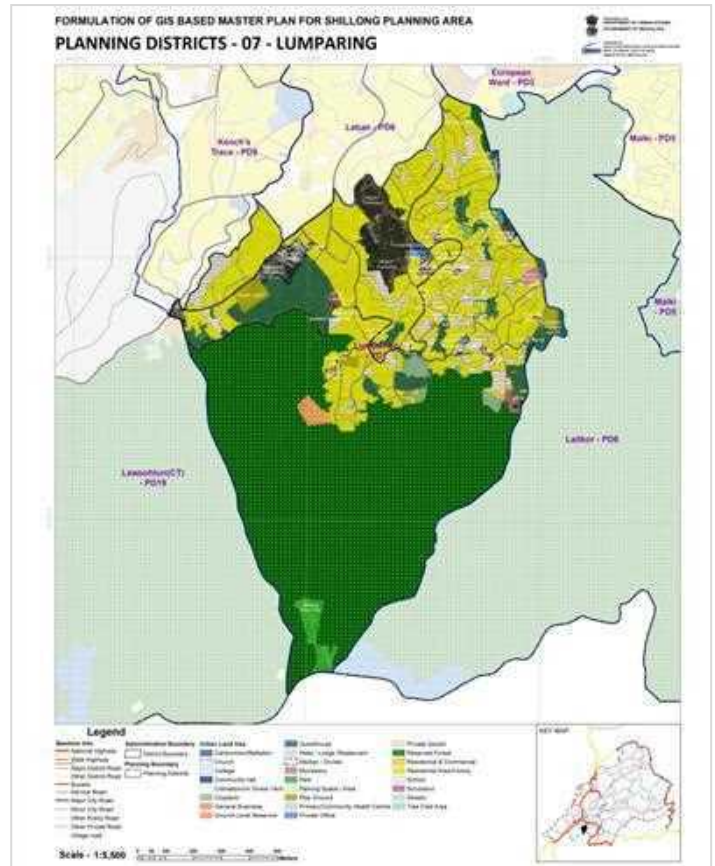


Figure 3-12: Planning District – 07 – Lumparing

Table 3-10: Existing ULU – PD07 – Lumparing

Lumparing - Categories	Area(Ha)	%age
Cantonment/Battalion	0.03	0.02
Church	0.19	0.12
College	1.02	0.65
Community hall	0.26	0.17
Crematorium/ Grave Yar	4.59	2.94
Cropland	1.43	0.92
General Business	0.01	0.01
Ground Level Reservoir	0.77	0.49
Guesthouse	0.03	0.02
Hotel / Lodge /Restaurant	0.43	0.27
Monastery	0.25	0.16
Park	1.65	1.06

Lumparing - Categories	Area(Ha)	%age
Play Ground	1.45	0.93
Primary/Community Health Centre	0.03	0.02
Private Office	0.24	0.15
Private Vacant	6.98	4.47
Reserved Forest	76.35	48.87
Residential & Com	0.21	0.13
Residential Area/Colony	42.71	27.34
School	1.61	1.03
Scrubland	0.25	0.16
Stream	0.03	0.02
Traffic and Transportation	6.65	4.26
Tree Clad Area	9.06	5.80
<b>Grand Total</b>	<b>156.22</b>	<b>100</b>

### 3.3.8 PLANNING DISTRICT NO.8 – LABAN

Figure 3-13: Planning District – 08 – Laban

**Area:** 35.11 Hectares

**Location:** Within the core area

**Major Landmarks:** Unitarian Church, Laban Namghar Complex, Laban Assamese Girl Higher Secondary School, Madina Masjid (*Figure 3-13*).

**General Description about the planning district:** The main land use category in Laban is residential area/colony, which covers 66.04% of the total area. Other significant categories include traffic and transportation (10.08%), residential and commercial (9.23%), and hotel/lodge/restaurant (1.18%). There are also several religious buildings, such as churches, mosques, and temples, which occupy smaller percentages of the total area (*Table 3-11*).

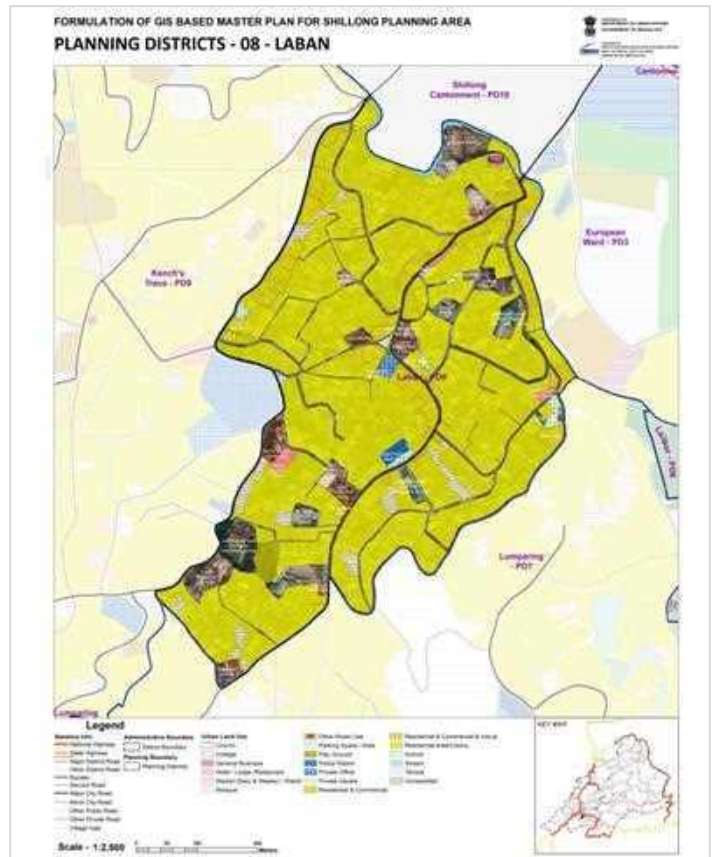


Table 3-11: Existing ULU - PD08 – Laban

Laban - Categories	Area(Ha)	%age
Church	0.52	1.50
College	0.13	0.36
General Business	0.19	0.54
Hotel / Lodge /Restaurant	0.41	1.18
Market (Daily & Weekly) / Mandi	0.10	0.27
Mosque	0.38	1.09
Other Mixed Use	0.12	0.35
Play Ground	0.22	0.64
Police Station	0.10	0.30
Private Office	0.09	0.25

Laban - Categories	Area(Ha)	%age
Private Vacant	0.79	2.26
Residential & Commercial	3.24	9.23
Residential & Commercial & Institutional	0.03	0.09
Residential Area/Colony	23.19	66.04
School	1.47	4.18
Stream	0.20	0.56
Temple	0.36	1.03
Traffic and Transportation	3.54	10.08
Unclassified	0.02	0.05
<b>Grand Total</b>	<b>35.11</b>	<b>100</b>

### 3.3.9 PLANNING DISTRICT NO.9 – KENCH'S TRACE

**Area:** 69.49 Hectares

**Location:** Within the core area

**Major Landmarks:** Meghalaya Legislative Assembly, The Shillong Times, Sankardev College, All Saints Church Cemetery (Figure 3-14).

**General Description about the planning district:** The most dominant land use category is Residential Area/Colony, covering 59.33% of the total area. Other significant categories include Office (4.58%), Private Vacant (3.37%), Quarter (3.52%), Traffic and Transportation (9.67%), Guesthouse (2.22%), Hotel / Lodge / Restaurant (1.79%), and School (1.51%) (Table 3-12).

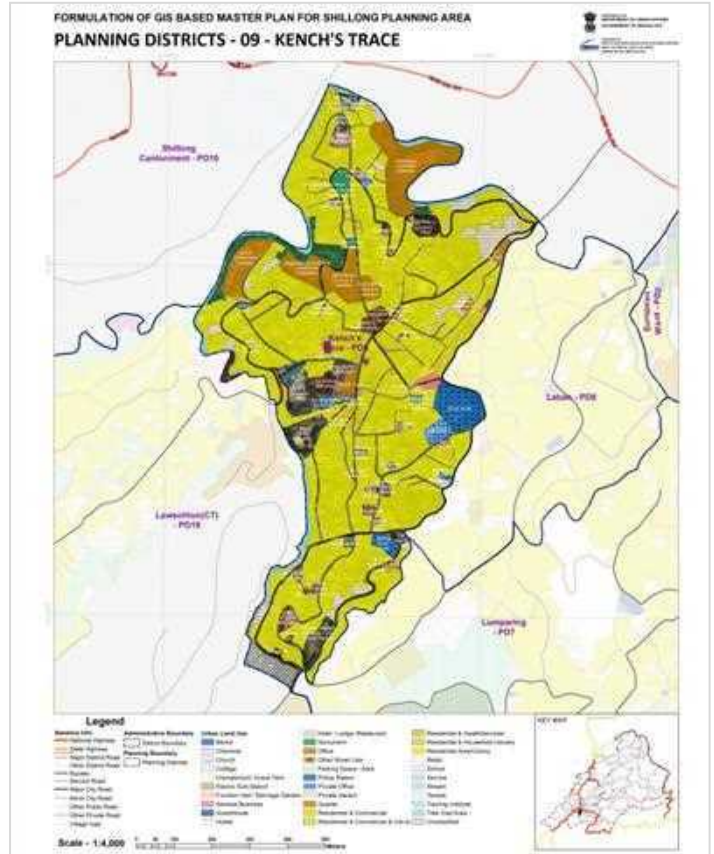


Table 3-12: Existing ULU - PD09 – Kench's Trace

Figure 3-14: Planning District – 09 – Kench's Trace

Kench's Trace - Categories	Area(Ha)	%age
Banks	0.07	0.10
Chemical	0.02	0.02
Church	0.03	0.04
College	1.00	1.43
Crematorium /Burial Ground /Grave Yard	0.69	0.99
Electric Sub-Station	0.01	0.02
Function Hall / Marriage	0.41	0.59
General Business	0.24	0.34
Guesthouse	1.54	2.22
Hostel	0.56	0.80
Hotel / Lodge /Restaurant	1.24	1.79
Monument	0.21	0.30
Office	3.18	4.58
Other Mixed Use	0.18	0.26
Police Station	0.04	0.05
Private Office	0.38	0.55

Kench's Trace - Categories	Area(Ha)	%age
Private Vacant	2.34	3.37
Quarter	2.44	3.52
Residential & Commercial	1.73	2.49
Residential & Commercial & Institutional	0.04	0.06
Residential & Health Services	0.02	0.03
Residential & Household Industry	0.10	0.15
Residential Area/Colony	41.23	59.33
Retail	0.03	0.04
School	1.05	1.51
Service	0.10	0.15
Stream	1.33	1.91
Temple	0.34	0.48
Traffic and Transportation	6.72	9.67
Training Institute	0.07	0.09
Tree Clad Area	1.30	1.87
Unclassified	0.86	1.23
<b>Grand Total</b>	<b>69.49</b>	<b>100</b>



### 3.3.10 PLANNING DISTRICT NO.10 – SHILLONG CANTONMENT

**Area:** 192.77 Hectares

**Location:** Within the core area

**Major Landmarks:** Lord Mahavira Park, NCC Headquarter, Galleria Anjalee Cinema, Anjalee Petrol Pump (Figure 3-15).

**General Description about the planning district:** In Shillong Cantonment area, the majority of the land is classified as "Unclassified" with 81.67%, followed by "Private Vacant" at 2.88%, "Residential & Commercial" at 1.43%, and "Traffic and Transportation" at 5.07%. The other land use categories have a relatively smaller percentage area (Table 3-13).

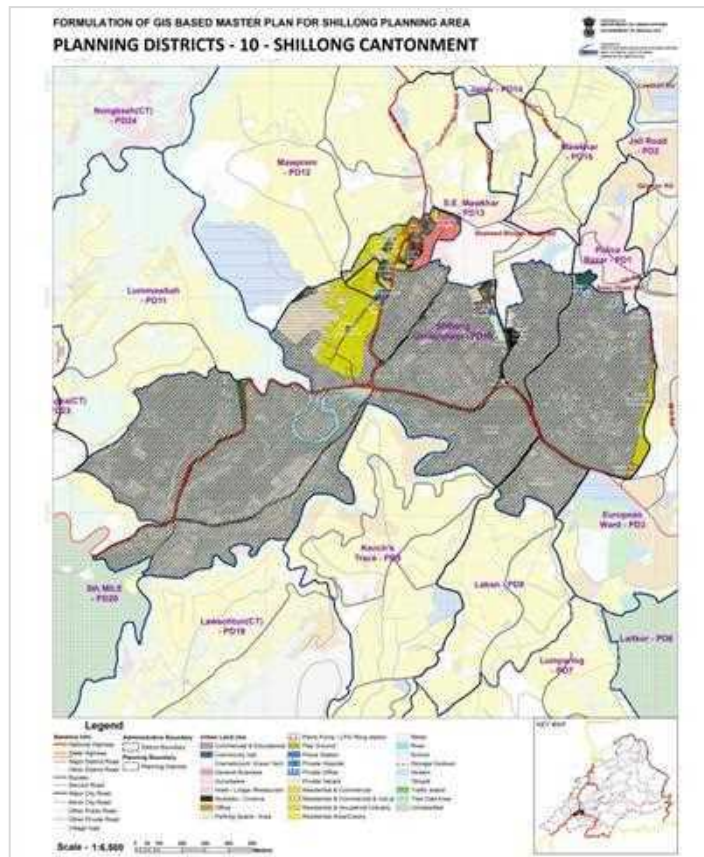


Table 3-13: Existing ULU - PD10 – Shillong Cantonment

Figure 3-15: Planning District – 10 – Shillong Cantonment

Shillong Cantonment	Area(Ha)	%age
Commercial & Educational	0.11	0.06
Community hall	0.04	0.02
Crematorium /Grave Yard	0.29	0.15
General Business	1.50	0.78
Ground Level Reservoir	0.00	0.00
Gurudwara	0.03	0.02
Hotel / Lodge /Restaurant	0.09	0.05
Market (Daily & Weekly)/	0.00	0.00
Multiplex / Cinema	0.33	0.17
Non- notified Slum	0.00	0.00
Office	0.64	0.33
Petrol Pump / LPG Filling Station	0.03	0.02
Play Ground	0.08	0.04
Police Station	0.07	0.04
Private Hospital	0.31	0.16
Private Office	0.03	0.02

Shillong Cantonment	Area(Ha)	%age
Private Vacant	5.56	2.88
Reserved Forest	0.00	0.00
Residential & Commercial	2.75	1.43
Residential & Commercial & Inst.al	0.11	0.06
Residential & Household Industry	0.00	0.00
Residential Area/Colony	7.53	3.91
Retail	1.54	0.80
River	0.12	0.06
School	0.67	0.35
Storage Godown	0.35	0.18
Stream	2.21	1.15
Temple	0.49	0.25
Traffic and Transportation	9.78	5.07
Tree Clad Area	0.68	0.35
Unclassified	157.44	81.67
<b>Grand Total</b>	<b>192.77</b>	<b>100</b>

### 3.3.11 PLANNING DISTRICT NO.11 – LUMMAWBAH

**Area:** 79.3 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** Church of God Lummawbah, Shon Roy Basan high School, Trumpet Church  
(Figure 3-16).

**General Description about the planning district:** The dominant land use in Lummawbah is tree-clad area, which covers 56.65% of the total area. Other significant land uses include residential areas/colonies (26.54%), private vacant land (5.04%), traffic and transportation (3.28%), cropland (2.06%), and fallow land (1.05%). The remaining land uses are less than 1% (Table 3-14).

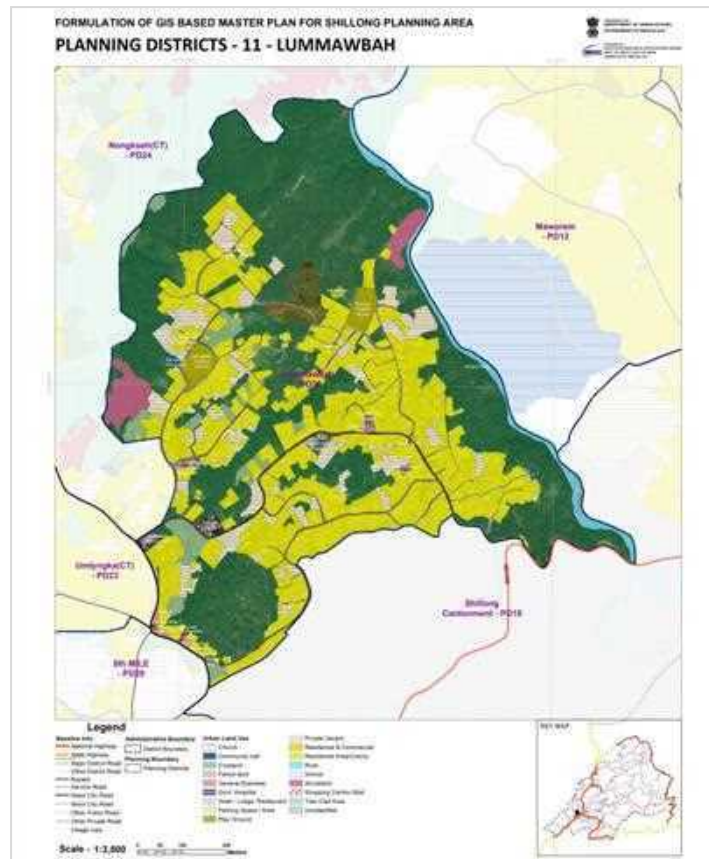


Table 3-14: Existing ULU - PD11 – Lummawbah

Figure 3-16: Planning District – 11 – Lummawbah

Lummawbah - Categories	Area(Ha)	%age
Church	0.61	0.62
Community hall	0.04	0.04
Cropland	2.02	2.06
Fallow land	1.03	1.05
General Business	0.10	0.10
Hotel / Lodge /Restaurant	0.03	0.03
Play Ground	1.05	1.07
Private Vacant	4.95	5.04
Residential & Commercial	0.16	0.17
Residential Area/Colony	26.11	26.54
River	1.52	1.54
School	0.21	0.21
Scrubland	1.45	1.47
Shopping Centre /Mall	0.04	0.04
Traffic and Transportation	3.22	3.28
Tree Clad Area	55.74	56.65
Unclassified	0.09	0.09
<b>Grand Total</b>	<b>79.3</b>	<b>100</b>

### 3.3.12 PLANNING DISTRICT NO.12 – MAWPREM

**Area:** 116.15 Hectares

**Location:** Within the core area

**Major Landmarks:** Mahari Petrol Pump, Khasi Hills Autonomous District Council, R.P. Chest Hospital Compound, Mawprem Presbyterian Church (Figure 3-17).

**General Description about the planning district:** The major land use type is residential area/colony, accounting for 46.64% of the total land area. Other significant land use types include burial ground/graveyard (6.24%), government hospital (9.25%), river (3.00%), school (1.60%), temple (1.86%), and traffic and transportation (5.23%) (Table 3-15).

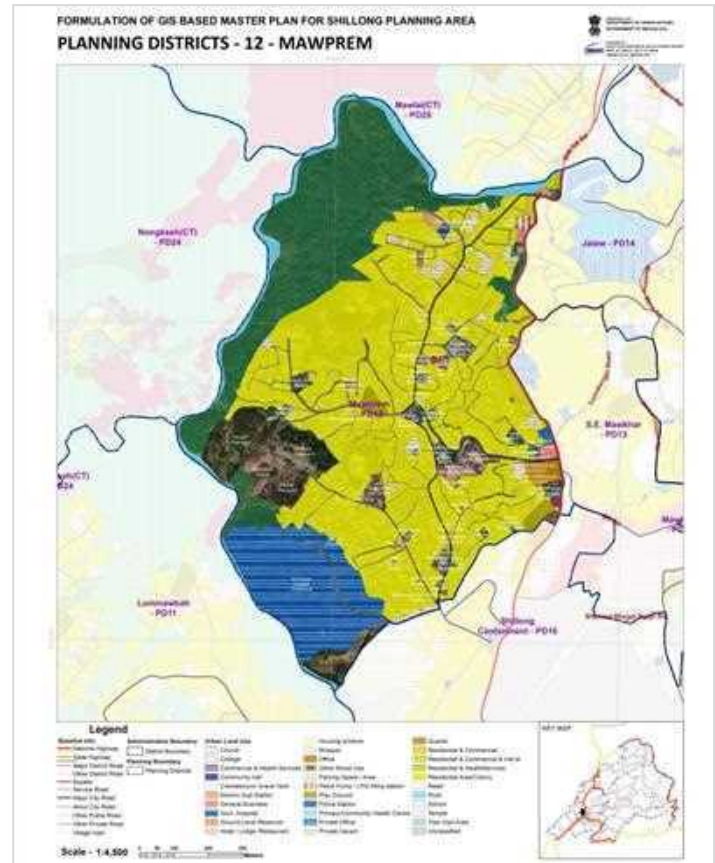


Figure 3-17: Planning District – 12 – Mawprem

Table 3-15: Existing ULU - PD12 – Mawprem

Mawprem - Categories	Area(Ha)	%age
Church	0.97	0.83
College	0.16	0.14
Commercial & Health Services	0.03	0.02
Community hall	0.19	0.16
Crematorium/ Grave Yard	7.25	6.24
Electric Sub-Station	0.18	0.15
General Business	0.34	0.29
Govt. Hospital	10.74	9.25
Ground Level Reservoir	0.08	0.07
Hotel / Lodge /Restaurant	0.06	0.05
Housing scheme	0.10	0.08
Mosque	0.03	0.02
Office	0.50	0.43
Other Mixed Use	0.10	0.09
Petrol Pump / LPG Filling Station	0.20	0.17
Play Ground	0.73	0.63

Mawprem - Categories	Area(Ha)	%age
Police Station	0.16	0.13
Primary/Community Health Centre	0.11	0.10
Private Office	0.02	0.02
Private Vacant	1.57	1.35
Quarter	0.11	0.09
Residential & Commercial	1.93	1.66
Residential & Commercial & Inst.al	0.11	0.10
Residential & Health Services	0.07	0.06
Residential Area/Colony	54.17	46.64
Retail	0.00	0.00
River	3.48	3.00
School	1.86	1.60
Temple	2.16	1.86
Traffic and Transportation	6.07	5.23
Tree Clad Area	22.68	19.53
<b>Grand Total</b>	<b>116.15</b>	<b>100</b>

### 3.3.13 PLANNING DISTRICT NO.13 – S.E. MAWKHAR

**Area:** 33.28 Hectares

**Location:** Within the core area

**Major Landmarks:** Garikhana Junction, Synod College, Lewduh, Bara Bazar Police Point, Sohra Cab Stand (Figure 3-18).

**General Description about the planning district:** PD has a diverse land use pattern, with a significant portion of the area being used for residential purposes (34.32%). The area also has a prominent market (14.50%) and a considerable portion of land is designated for traffic and transportation (12.27%) (Table 3-16).

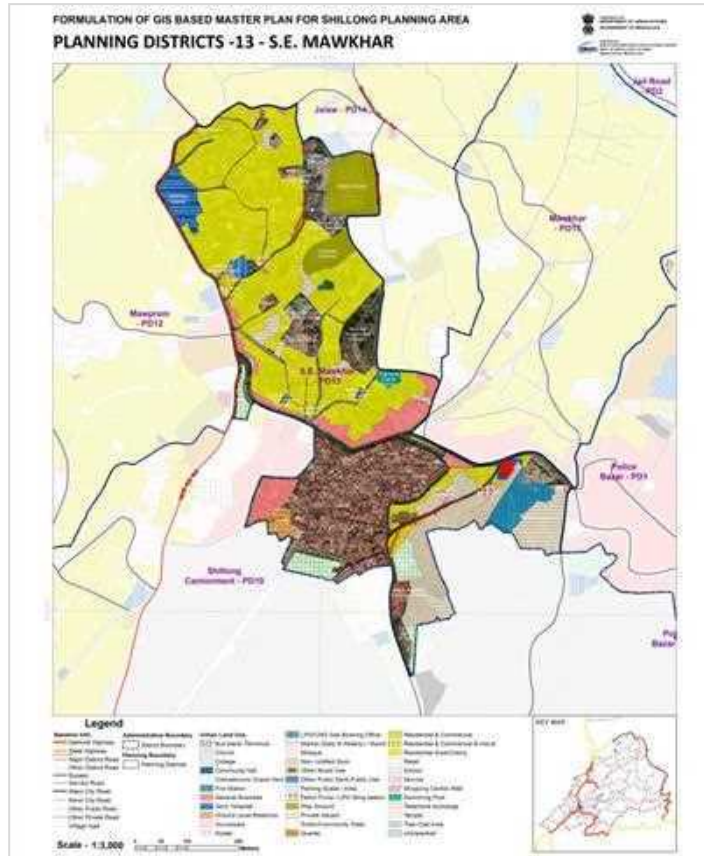


Figure 3-18: Planning District – 13 – S.E. Mawkhar

Table 3-16: Existing ULU - PD13 – S.E. Mawkhar

S.E. Mawkhar - Categories	Area(Ha)	%age
Church	0.32	0.97
College	0.30	0.90
Community hall	0.02	0.05
Crematorium /Grave Yard	0.84	2.52
Fire Station	0.70	2.11
General Business	1.66	4.97
Govt. Hospital	0.58	1.75
Ground Level Reservoir	0.16	0.48
Gurudwara	0.06	0.17
Hostel	0.10	0.29
LPG/CNG Gas Booking Office	0.12	0.35
Market (Daily & Weekly) / Mandi	4.83	14.50
Mosque	0.04	0.11
Non- notified Slum	1.96	5.88
Other Mixed Use	0.18	0.53
Petrol Pump / LPG Filling Station	0.05	0.15

S.E. Mawkhar - Categories	Area(Ha)	%age
Play Ground	1.55	4.66
Private Vacant	1.46	4.37
Quarter	0.09	0.27
Residential & Commercial	0.88	2.64
Residential & Commercial & Inst.al	0.03	0.10
Residential Area/Colony	11.42	34.32
Retail	0.44	1.33
School	0.93	2.79
Service	0.06	0.18
Shopping Centre /Mall	0.16	0.47
Swimming Pool	0.11	0.34
Telephone exchange	0.03	0.09
Temple	0.08	0.23
Traffic and Transportation	4.08	12.27
Tree Clad Area	0.05	0.14
<b>Grand Total</b>	<b>33.28</b>	<b>100</b>

### 3.3.14 PLANNING DISTRICT NO.14 – JAIAW

**Area:** 60.05 Hectares

**Location:** Within the core area

**Major Landmarks:** Madan Weiking, Seng Khasi Higher Secondary School, Dr. H. Gordon Roberts Hospital (Figure 3-19).

**General Description about the planning district:** The major land uses in Jaiaw include residential areas/colonies (41.95%), private vacant land (4.12%), private hospitals (3.33%), schools (6.35%), traffic and transportation (10.44%), and tree-clad areas (8.73%). Other notable land uses include churches (1.58%), colleges (1.62%), nursing homes (4.32%), and streams (2.73%) (Table 3-17).

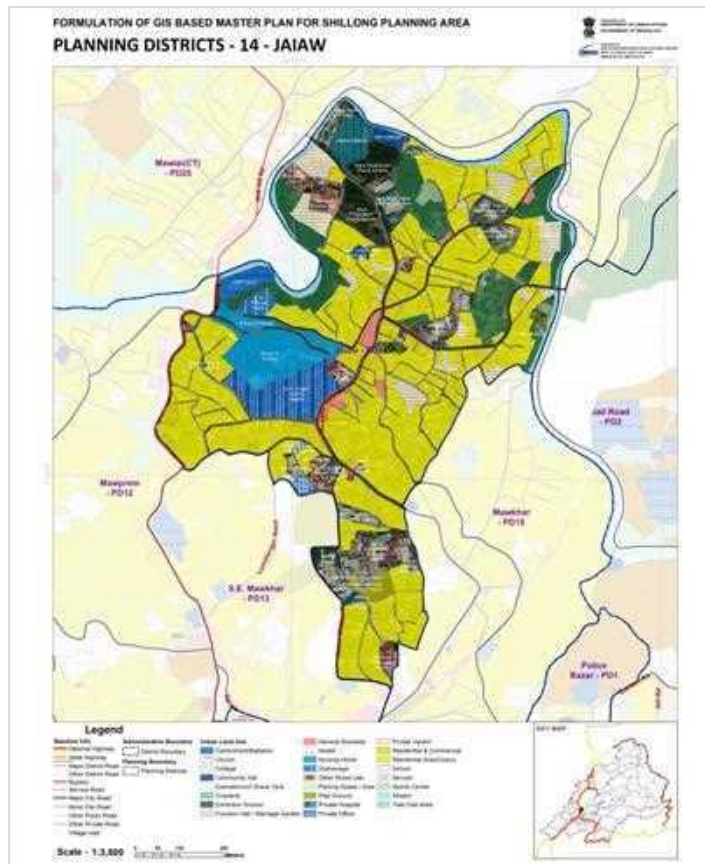


Figure 3-19: Planning District – 14 – Jaiaw

Table 3-17: Existing ULU - PD14 – Jaiaw

Jaiaw - Categories	Area(Ha)	%age	Jaiaw - Categories	Area(Ha)	%age
Cantonment/Battalion	0.58	0.96	Play Ground	0.35	0.59
Church	0.95	1.58	Private Hospital	2.00	3.33
College	0.97	1.62	Private Office	0.21	0.34
Community hall	0.40	0.66	Private Vacant	2.48	4.12
Crematorium /Burial Ground /Grave Yard	1.58	2.63	Residential & Commercial	2.49	4.14
Cropland	0.20	0.33	Residential Area/Colony	25.19	41.95
Exhibition Ground	0.79	1.31	School	3.81	6.35
Function Hall / Marriage Garden	0.35	0.58	Service	0.27	0.44
General Business	0.49	0.81	Sports Centre	0.54	0.91
Hostel	0.27	0.45	Stream	1.64	2.73
Nursing Home	2.59	4.32	Traffic and Transportation	6.27	10.44
Orphanage	0.35	0.58	Tree Clad Area	5.24	8.73
Other Mixed Use	0.05	0.09	<b>Grand Total</b>	<b>60.05</b>	<b>100</b>

### 3.3.15 PLANNING DISTRICT NO.15 – MAWKHAR

**Area:** 29.56 Hectares

**Location:** Within the core area

**Major Landmarks:** Mothphran point, Ri Khasi Press, Seng Khasi Hall, Christian Academy, Mawkhar Presbyterian Church (Figure 3-20).

**General Description about the planning district:** The Mawkhar table includes a variety of land uses, with the majority of the area being designated as residential (66.22%). Other significant land uses include general business (3.85%), residential and commercial (5.63%), schools (4.78%), and traffic and transportation (10.29%). There are also smaller areas designated for religious use (churches and temples), mixed use, public facilities (such as public toilets), and tree-clad areas (Table 3-18).



Figure 3-20: Planning District – 15 – Mawkhar

Table 3-18: Existing ULU - PD15 – Mawkhar

Mawkhar - Categories	Area(Ha)	%age
Church	0.30	1.00
Community hall	0.05	0.17
Drain	0.17	0.58
Function Hall / Marriage Garden	0.05	0.16
General Business	1.14	3.85
Ground Level Reservoir	0.00	0.01
Museum	0.03	0.11
Office	0.11	0.37
Other Mixed Use	0.08	0.28
Other Public Semi-Public Use	0.00	0.01
Ponds	0.05	0.16
Private Office	0.16	0.55
Private Vacant	0.06	0.20

Mawkhar - Categories	Area(Ha)	%age
Public/Community Toilet	0.00	0.01
Residential & Commercial	1.66	5.63
Residential Area/Colony	19.57	66.22
Retail	0.06	0.20
School	1.41	4.78
Shopping Centre /Mall	0.14	0.46
Stream	0.50	1.69
Temple	0.05	0.16
Traffic and Transportation	3.04	10.29
Training Institute	0.04	0.14
Tree Clad Area	0.85	2.88
Warehouse	0.02	0.08
<b>Grand Total</b>	<b>29.56</b>	<b>100</b>

### 3.3.16 PLANNING DISTRICT NO.16 – PYNTHORMUKHRAH (CT)

**Area:** 276.33 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** The Golf Course, Polo Ground, ED Office, Shillong Sub Zonal Office, Training Institute of Bellefonte, Saw Aiom Swimming Pool (Figure 3-21).

**General Description about the planning district:** The majority of the area is covered by Golf Course (16.38%), followed by Reserved Forest (15.04%) and Residential Area/Colony (26.91%). Cropland (6.37%), Private Vacant (8.29%), and Traffic and Transportation (6.94%) also occupy a significant portion of the area. Other land uses include Crematorium /Burial Ground /Grave Yard (0.95%), General Business (0.50%), and Office (0.90%) (Table 3-19).

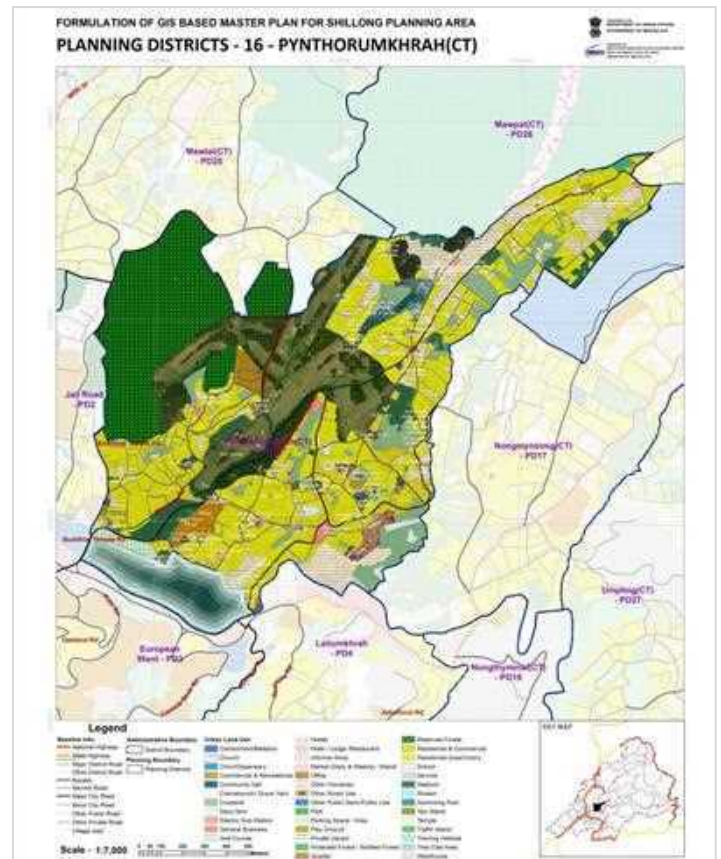


Figure 3-21: Planning District – 16 – Pynthormukhrah (CT)

Table 3-19: Existing ULU - PD16 – Pynthormukhrah (CT)

Pynthormukhrah(CT) - Categories	Area(Ha)	%age
Cantonment/Battalion	0.08	0.03
Church	0.90	0.32
Clinic/Dispensary	0.04	0.01
Commercial & Recreational	0.15	0.05
Community hall	0.08	0.03
Crematorium/ Grave Yard	2.63	0.95
Cropland	17.61	6.37
Dairy farm	1.23	0.45
Electric Sub-Station	0.11	0.04
General Business	1.39	0.50
Golf Course	45.25	16.38
Guesthouse	0.05	0.02
Gymnasium	0.03	0.01
Hostel	0.03	0.01
Hotel / Lodge /Restaurant	0.74	0.27
Informal Shop	0.02	0.01
Market (Daily & Weekly) / Mand	0.05	0.02
Office	2.49	0.90
Other Industries	0.00	0.00
Other Mixed Use	0.02	0.01

Pynthormukhrah(CT) - Categories	Area(Ha)	%age
Other Public Semi-Public Use	0.02	0.01
Park	0.03	0.01
Play Ground	0.38	0.14
Private Vacant	22.90	8.29
Protected Forest / Notified F	0.61	0.22
Quarter	1.47	0.53
Reserved Forest	41.56	15.04
Residential & Commercial	9.60	3.47
Residential Area/Colony	74.35	26.91
School	2.24	0.81
Service	0.29	0.10
Stadium	15.42	5.58
Stream	0.96	0.35
Swimming Pool	0.07	0.03
Temple	0.04	0.01
Traffic and Transportation	19.17	6.94
Training Institute	3.21	1.16
Tree Clad Area	9.25	3.35
Warehouse	1.85	0.67
<b>Grand Total</b>	<b>276.33</b>	<b>100</b>

### 3.3.17 PLANNING DISTRICT NO.17 – NONGMYNSONG (CT)

**Area:** 139.51 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** BDW International School, Pentecostal Mission Centre Faith Home, St. Jerome's Church, Atomic Mineral Directorate (Figure 3-22).

**General Description about the planning district:** The majority of the area is used for residential purposes, with residential areas/colonies occupying 37.51% of the total area, followed by croplands (20.05%), private vacant lands (14.33%), and traffic and transportation areas (7.42%). Other notable land uses include function halls/marriage gardens (1.30%), housing schemes (1.81%), and offices (3.09%) (Table 3-20).

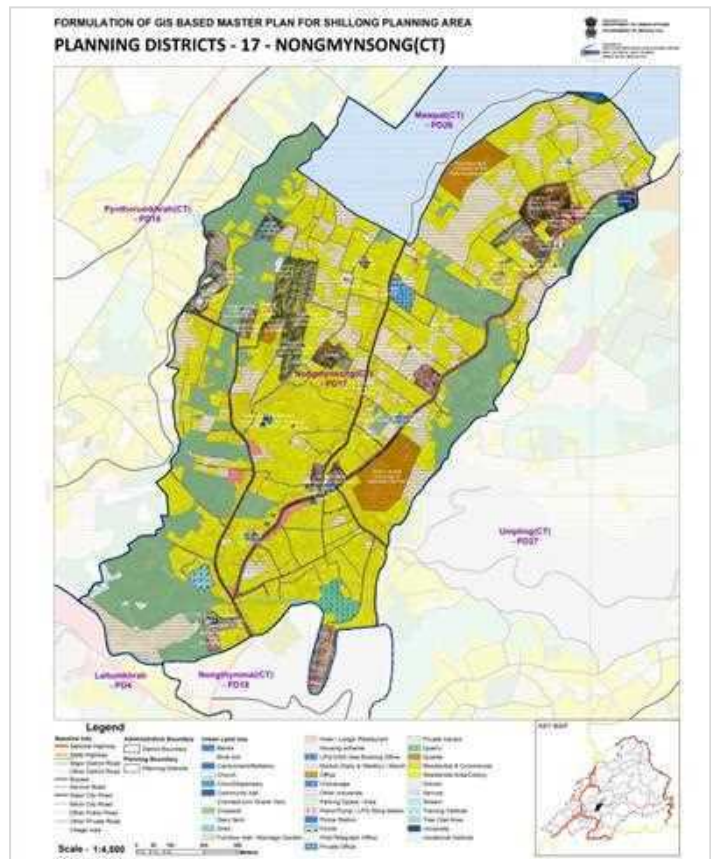


Table 3-20: Existing ULU - PD17 – Nongmynsong (CT)

Figure 3-22: Planning District – 17 – Nongmynsong (CT)

Nongmynsong(CT) - Categories	Area(Ha)	%age
Banks	0.10	0.07
Brick kiln	0.04	0.03
Cantonment/Battalion	0.15	0.11
Church	2.00	1.43
Clinic/Dispensary	0.03	0.02
Community hall	0.07	0.05
Crematorium /Grave Yard	0.66	0.47
Cropland	27.97	20.05
Dairy farm	0.62	0.45
Drain	0.03	0.02
Function Hall / Marriage	1.81	1.30
General Business	0.90	0.64
Hotel / Lodge /Restaurant	0.03	0.02
Housing scheme	2.52	1.81
LPG/CNG Gas Booking	0.07	0.05
Market (Daily & Weekly)	0.21	0.15
Office	4.31	3.09
Orphanage	0.02	0.02
Other Industries	0.01	0.01

Nongmynsong(CT) - Categories	Area(Ha)	%age
Petrol Pump / LPG Filling	0.09	0.06
Police Station	0.01	0.01
Ponds	0.37	0.27
Post/Telegraph Office	0.03	0.02
Private Office	0.50	0.36
Private Vacant	19.99	14.33
Quarry	0.92	0.66
Quarter	0.19	0.14
Residential & Commercial	7.68	5.50
Residential Area/Colony	52.34	37.51
School	3.51	2.52
Service	0.67	0.48
Stream	0.77	0.55
Traffic and Transportation	10.35	7.42
Training Institute	0.02	0.01
Tree Clad Area	0.26	0.19
University	0.22	0.16
Vocational Institute	0.03	0.02
<b>Grand Total</b>	<b>139.51</b>	<b>100</b>



### 3.3.18 PLANNING DISTRICT NO.18 – NONGTHYMMAI (CT)

**Area:** 326.78 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** Fire Bridge, NEC, Assam Rifle house, IIM, NIFT, Jelly Shop Point, St. Dominic College (*Figure 3-23*).

**General Description about the planning district:** The major land uses in the area are residential areas/colonies (42.44%), followed by offices (6.33%), traffic and transportation (8.31%), tree-clad areas (4.62%), quarters (5.17%), reserved forest (4.19%), and general business (1.64%). The *Table 3-21* also shows that a significant proportion of the area (9.73%) is classified as unclassified.

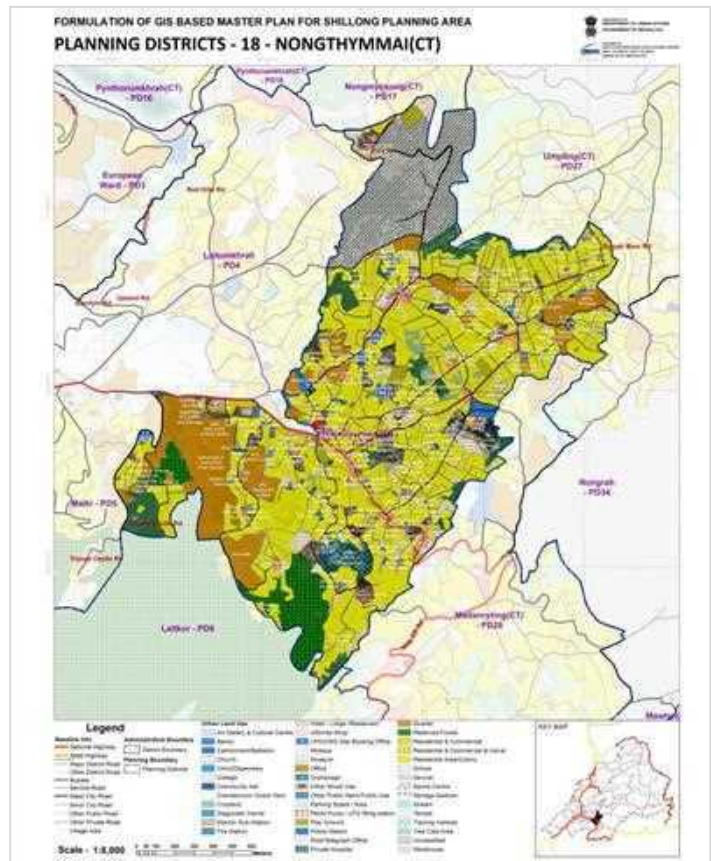


Figure 3-23: Planning District – 18 – Nongthymmai (CT)

Table 3-21: Existing ULU - PD18 – Nongthymmai (CT)

Nongthymmai(CT) - Categories	Area(Ha)	%age
Art Gallery & Cultural Cent	0.14	0.04
Banks	0.06	0.02
Cantonment/Battalion	0.68	0.21
Church	1.83	0.56
Clinic/Dispensary	0.30	0.09
College	2.36	0.72
Community hall	0.15	0.04
Crematorium/ Grave Yard	1.77	0.54
Cropland	2.40	0.74
Diagnostic Centre	0.15	0.05
Electric Sub-Station	0.23	0.07
Fire Station	0.16	0.05
General Business	5.35	1.64
Govt. Hospital	0.96	0.29
Office	20.69	6.33
Hostel	1.99	0.61
Hotel / Lodge / Restaurant	3.31	1.01
LPG/CNG Gas Booking	0.02	0.01
Petrol Pump / LPG Filling	0.39	0.12
Museum	0.14	0.04

Nongthymmai(CT) - Categories	Area(Ha)	%age
Play Ground	3.48	1.06
Police Station	0.16	0.05
Post/Telegraph Office	0.17	0.05
Private Hospital	0.48	0.15
Private Office	1.35	0.41
Private Vacant	10.77	3.30
Quarter	16.88	5.17
Reserved Forest	13.68	4.19
Residential & Commercial	9.36	2.86
Residential Area/Colony	138.69	42.44
School	6.30	1.93
Service	0.66	0.20
Storage Godown	0.43	0.13
Stream	1.32	0.40
Temple	0.20	0.06
Traffic and Transportation	27.15	8.31
Training Institute	4.35	1.33
Tree Clad Area	15.08	4.62
Unclassified	31.80	9.73
<b>Grand Total</b>	<b>326.78</b>	<b>100</b>

### 3.3.19 PLANNING DISTRICT NO.19 – LAWSOHTUN (CT)

**Area:** 630.33 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** Shillong View Point, Sankardev College, Lawsohtun Community hall (*Figure 3-24*).

**General Description about the planning district:** The Lawsohtun (CT) table shows that the majority of the land in the area is reserved forest (73.69%), followed by unclassified land (5.59%) and residential areas/colonies (6.02%). Scrubland accounts for 2.04% of the land, while tree-clad areas make up 3.51%. Training institutes and private vacant lands have a share of 1.98% and 1.77%, respectively (*Table 3-22*).

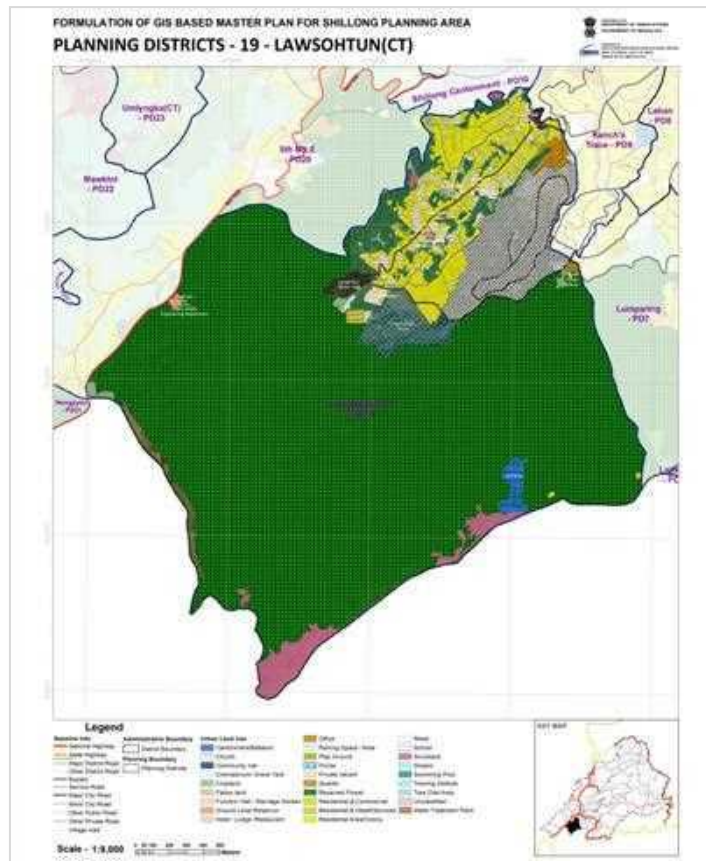


Figure 3-24: Planning District – 19 - Lawsohtun (CT)

Table 3-22: Existing ULU - PD19 – Lawsohtun (CT)

Lawsohtun(CT) - Categories	Area(Ha)	%age
Cantonment/Battalion	3.52	0.56
Church	0.30	0.05
Community hall	0.05	0.01
Crematorium/ Grave Yard	2.87	0.46
Cropland	3.80	0.60
Fallow land	4.76	0.76
Function Hall / Marriage	0.12	0.02
Ground Level Reservoir	0.12	0.02
Hotel / Lodge /Restaurant	0.63	0.10
Office	0.46	0.07
Play Ground	1.10	0.18
Ponds	0.08	0.01
Private Vacant	11.17	1.77
Quarter	2.58	0.41

Lawsohtun(CT) - Categories	Area(Ha)	%age
Reserved Forest	464.48	73.69
Residential & Commercial	0.30	0.05
Residential & Health	0.07	0.01
Residential Area/Colony	37.95	6.02
Retail	0.01	0.00
School	0.13	0.02
Scrubland	12.88	2.04
Stream	1.14	0.18
Swimming Pool	0.00	0.00
Traffic and Transportation	11.51	1.83
Training Institute	12.49	1.98
Tree Clad Area	22.13	3.51
Unclassified	35.25	5.59
Water Treatment Plant	0.43	0.07
<b>Grand Total</b>	<b>630.33</b>	<b>100</b>

### 3.3.20 PLANNING DISTRICT NO.20 – 5<sup>TH</sup> MILE

**Area:** 225.1 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** IMD, Forest & Environment Department, Don Bosco Sunnyside, St. Paul's Apostolic Campus (Figure 3-25).

**General Description about the planning district:** The largest land use category is tree-clad area, accounting for 27.7% of the area, followed by reserved forest (23.61%), residential area/colony (18.43%), and cropland (11.86%) as shown in Table 3-23. Other notable categories include traffic and transportation (4.49%), private vacant land (3.48%), and scrubland (0.48%).

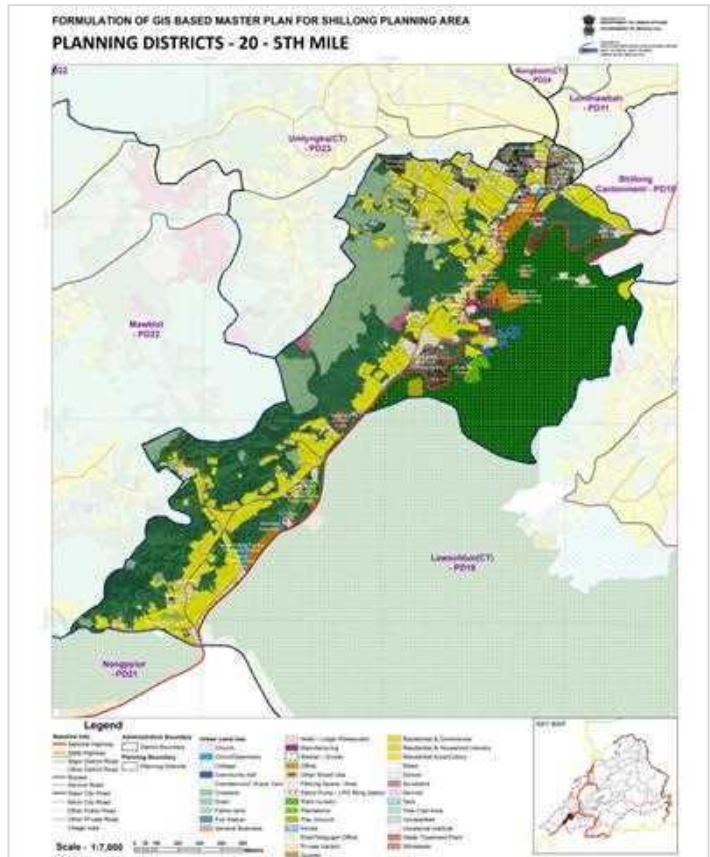


Table 3-23: Existing ULU - PD20 – 5<sup>th</sup> MILE

5th MILE - Categories	Area(Ha)	%age
Church	2.90	1.29
Clinic/Dispensary	0.23	0.10
College	0.40	0.18
Crematorium/ Grave Yard	1.53	0.68
Cropland	26.70	11.86
Fallow land	2.04	0.90
Fire Station	0.37	0.16
General Business	0.11	0.05
Government Asset	0.33	0.15
Guesthouse	0.68	0.30
Hostel	0.44	0.20
Hotel / Lodge /Restaurant	0.84	0.38
Manufacturing	0.07	0.03
Office	3.52	1.57
Other Mixed Use	0.24	0.10
Petrol Pump / LPG Filling	0.52	0.23
Plant nursery	0.26	0.12
Plantations	0.84	0.37

Figure 3-25: Planning District – 20 – 5<sup>th</sup>MILE

5th MILE - Categories	Area(Ha)	%age
Play Ground	0.52	0.23
Ponds	0.18	0.08
Private Vacant	7.82	3.48
Quarter	0.67	0.30
Reserved Forest	53.15	23.61
Residential & Commercial	0.66	0.29
Residential & Household Industry	0.14	0.06
Residential Area/Colony	41.49	18.43
Retail	0.03	0.01
School	4.15	1.84
Scrubland	1.08	0.48
Service	0.25	0.11
Tank	0.00	0.00
Traffic and Transportation	10.11	4.49
Tree Clad Area	62.34	27.70
Vocational Institute	0.24	0.11
Water Treatment Plant	0.14	0.06
<b>Grand Total</b>	<b>225.10</b>	<b>100</b>

### 3.3.21 PLANNING DISTRICT NO.21 - NONGPYIUR

**Area:** 607.19 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** Orchidarium, Elephant Falls, Animal Husbandry and Veterinary Office (*Figure 3-26*).

**General Description about the planning district:** The largest land use category is tree-clad area, accounting for 48.62% of the total land area, followed by reserved forest (29.14%) and cropland (6.15%) as shown in *Table 3-24*. Other notable land uses include scrubland (1.90%), traffic and transportation (1.39%), and private vacant land (0.90%). The smallest land use categories are public/community toilet (0.00%), poultry farm (0.03%), and school (0.02%).

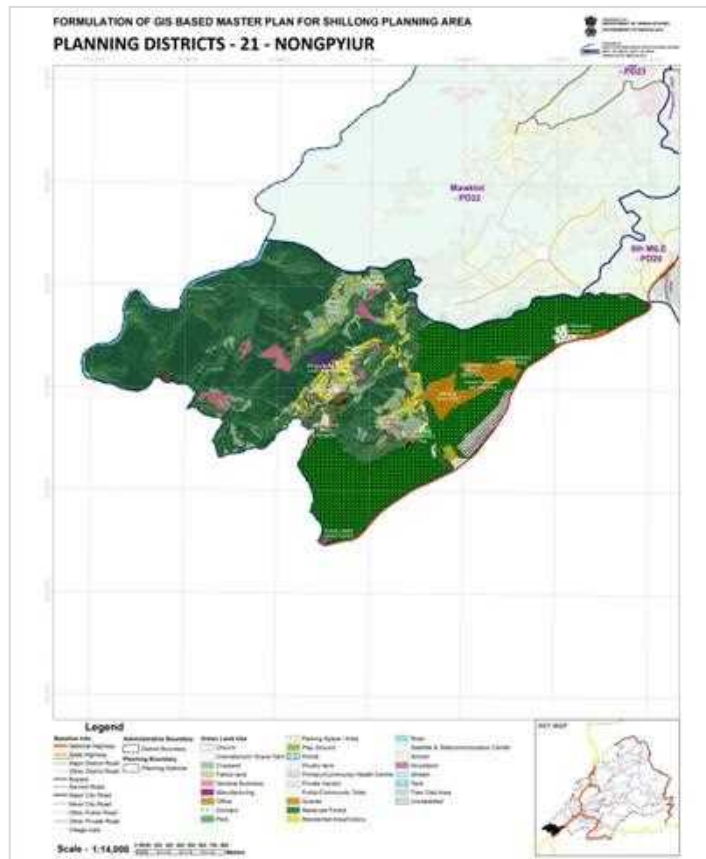


Figure 3-26: Planning District – 21 - Nongpyiur

Table 3-24: Existing ULU - PD21 - Nongpyiur

Nongpyiur - Categories	Area(Ha)	%age	Nongpyiur - Categories	Area(Ha)	%age
Church	0.35	0.06	Public/Community Toilet	0.01	0.00
Crematorium/ Grave Yard	0.46	0.08	Quarter	0.83	0.14
Cropland	37.32	6.15	Reserved Forest	176.92	29.14
Fallow land	17.43	2.87	Residential Area/Colony	15.64	2.58
General Business	0.08	0.01	River	5.29	0.87
Manufacturing	0.08	0.01	Satellite & Telecom Center	0.68	0.11
Office	17.51	2.88	School	0.10	0.02
Orchard	2.10	0.35	Scrubland	11.54	1.90
Park	0.94	0.15	Stream	0.13	0.02
Play Ground	1.10	0.18	Tank	0.05	0.01
Ponds	0.65	0.11	Traffic and Transportation	8.42	1.39
Poultry farm	0.16	0.03	Tree Clad Area	295.21	48.62
Primary/CHC	0.76	0.13	Unclassified	7.98	1.31
Private Vacant	5.45	0.90	<b>Grand Total</b>	<b>607.19</b>	<b>100</b>

### 3.3.22 PLANNING DISTRICT NO.22 - MAWKLOT

**Area:** 747.26 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** John Roberts Theological College, Gas Godown, Nongumlong Football Ground as shown in *Figure 3-27*.

**General Description about the planning district:** The major categories of land use are tree-clad area with 66.25%, cropland with 17.84%, residential area/colony with 5.25%, and traffic and transportation with 1.54%. The remaining have relatively smaller percentages as shown in as shown in *Table 3-25* reserved forest, scrubland, fallow land, church, college, playground, ponds, private vacant, crematorium/burial ground/grave yard, river, school, community hall, storage godown, and telephone exchange in the Mawklot region.

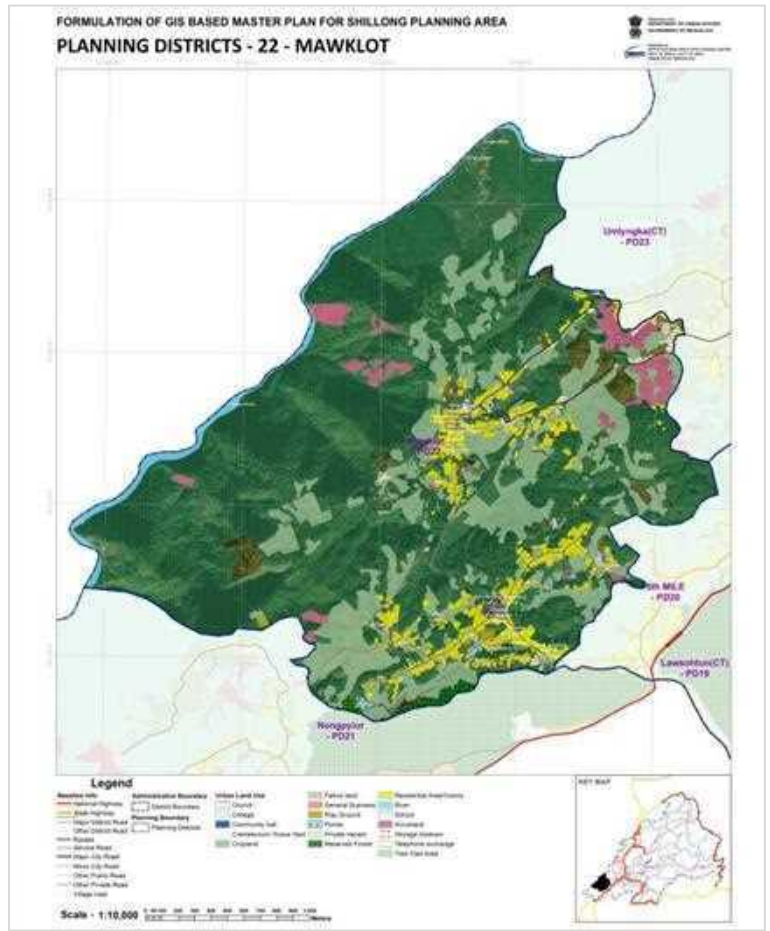


Figure 3-27: Planning District – 22 - Mawklot

Table 3-25: Existing ULU - PD22 - Mawklot

Mawklot - Categories	Area(Ha)	%age
Church	0.51	0.07
College	1.43	0.19
Crematorium/ Grave Yard	0.19	0.03
Cropland	133.29	17.84
Fallow land	21.40	2.86
Play Ground	2.27	0.30
Ponds	1.23	0.16
Private Vacant	5.90	0.79
Reserved Forest	3.83	0.51
Residential Area/Colony	39.23	5.25
River	12.60	1.69
School	0.13	0.02
Scrubland	18.56	2.48
Storage Godown	0.13	0.02
Traffic and Transportation	11.48	1.54
Tree Clad Area	495.02	66.25
<b>Grand Total</b>	<b>747.26</b>	<b>100</b>

### 3.3.23 PLANNING DISTRICT NO.23 – UMLYNGKA (CT)

**Area:** 394.49 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** Umlyngka Presbyterian Church, Mawkhyndew Trek (Figure 3-28).

**General Description about the planning district:** The majority of the area is covered by tree-clad land, which accounts for 56.36% of the total area. Cropland is the second most prevalent land use, covering 21.51% of the area, followed by residential areas/colonies, which cover 13.19%. Other land uses include private vacant land (1.84%), river (1.75%), traffic and transportation (2.05%), and scrubland (2.03%) (Table 3-25).

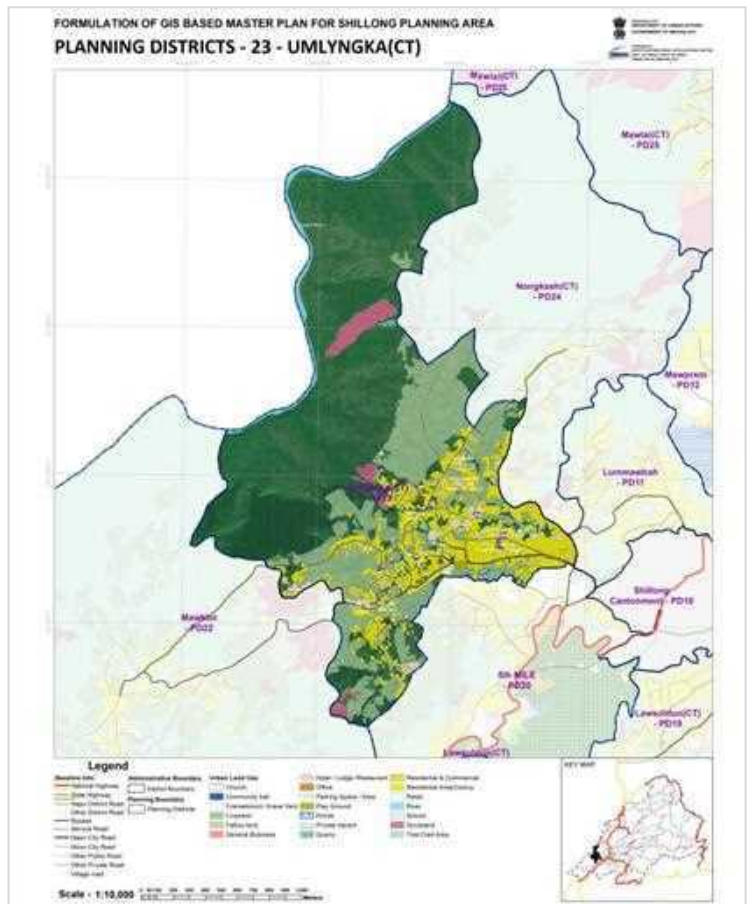


Figure 3-28: Planning District – 23 – Umlyngka (CT)

Table 3-26: Existing ULU - PD23 – Umlyngka (CT)

Umlyngka(CT) - Categories	Area(Ha)	%age
Church	0.43	0.11
Community hall	0.06	0.02
Cropland	84.85	21.51
Fallow land	2.06	0.52
General Business	0.09	0.02
Play Ground	0.50	0.13
Ponds	0.32	0.08
Private Vacant	7.25	1.84
Quarry	0.34	0.09
Residential & Commercial	0.77	0.20
Residential Area/Colony	52.04	13.19
River	6.89	1.75
School	0.46	0.12
Scrubland	7.99	2.03
Traffic and Transportation	8.08	2.05
Tree Clad Area	222.33	56.36
<b>Grand Total</b>	<b>394.49</b>	<b>100</b>

### 3.3.24 PLANNING DISTRICT NO.24 – NONGKSEH (CT)

**Area:** 273.94 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** Madonna Convent, Nongkseh Rim, Nongkseh View Point (Figure 3-29).

**General Description about the planning district:** In the Nongkseh area, the majority of the land is covered with tree-clad areas (73.19%). Cropland covers 12.71% of the land and residential areas/colonies cover 3.91%. Scrubland covers 5.09% of the land, and the river covers 1.81%. Other categories such as private vacant land, fallow land, and play areas make up less than 2% each (Table 3-27).

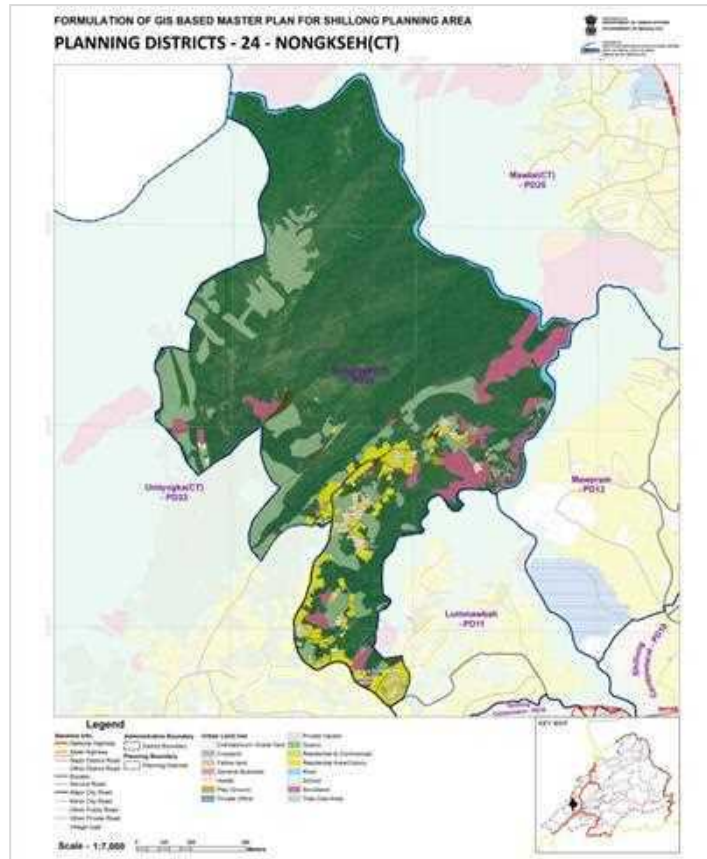


Figure 3-29: Planning District – 24 – Nongkseh (CT)

Table 3-27: Existing ULU - PD24 – Nongkseh (CT)

Nongkseh(CT) - Categories	Area(Ha)	%age
Crematorium/ Grave Yard	0.12	0.05
Cropland	34.83	12.71
Fallow land	2.34	0.86
General Business	0.01	0.00
Hostel	0.33	0.12
Play Ground	0.16	0.06
Private Office	0.08	0.03
Private Vacant	3.55	1.30
Quarry	0.02	0.01
Residential & Commercial	0.03	0.01
Residential Area/Colony	10.72	3.91
River	4.95	1.81
School	0.11	0.04
Scrubland	13.95	5.09
Traffic and Transportation	2.22	0.81
Tree Clad Area	200.51	73.19
<b>Grand Total</b>	<b>273.94</b>	<b>100</b>

### 3.3.25 PLANNING DISTRICT NO.25 - MAWLAI (CT)

**Area:** 2546.59 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** NEHU, ISBT, Mawroh Junction, FCI, My Cafe, Abattoir, Banalari Showroom, Mawlai petrol pump, Sacred Heart Theological College, Shillong Polytechnic (Figure 3-30).

**General Description about the planning district:** The most significant categories are Reserved Forest (17.88%), University (14.90%), and Tree Clad Area (29.89%). There are also significant areas of Residential Area/Colony (9.66%), Traffic and Transportation (4.31%), and Private Vacant (4.36%) (Table 3-28).

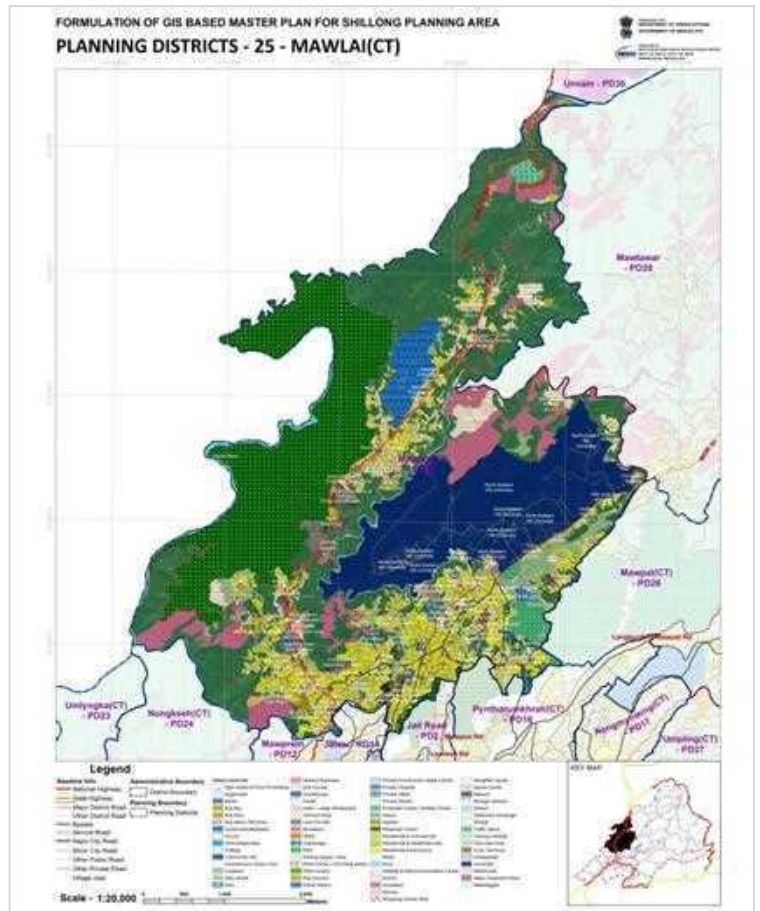


Figure 3-30: Planning District – 25 – Mawlai (CT)

Table 3-28: Existing ULU - PD25 – Mawlai (CT)

Mawlai(CT)- Categories	Area(Ha)	%age
Agro based & Food Process	4.01	0.16
Banks	0.04	0.00
Cantonment/Battalion	50.96	2.00
Church	4.67	0.18
Clinic/Dispensary	0.07	0.00
College	9.26	0.36
Crematorium/ Grave Yard	4.85	0.19
Cropland	68.28	2.68
Dam	0.49	0.02
Electric Sub-Station	3.81	0.15
Fallow land	1.28	0.05
General Business	4.18	0.16
Golf Course	0.65	0.03
Hostel	0.67	0.03
Hotel / Lodge /Restaurant	3.89	0.15
Informal Shop	0.16	0.01
Land Fill Site	6.89	0.27

Mawlai(CT)- Categories	Area(Ha)	%age
Private Office	0.13	0.01
Private Vacant	111.06	4.36
Protected Forest / Notified	25.16	0.99
Quarry	8.99	0.35
Quarter	1.73	0.07
Reserved Forest	455.44	17.88
Residential & Commercial	30.62	1.20
Residential Area/Colony	246.07	9.66
River	22.55	0.89
School	9.25	0.36
Scrubland	147.86	5.81
Service	13.10	0.51
Slaughter House	1.62	0.06
Sports Centre	0.23	0.01
Stadium	0.84	0.03
Storage Godown	4.97	0.20
Stream	18.50	0.73



Office	1.82	0.07	Traffic and Transportation	109.76	4.31
Orphanage	0.18	0.01	Training Institute	13.95	0.55
Park	0.72	0.03	Tree Clad Area	761.14	29.89
Petrol Pump / LPG Filling	1.77	0.07	Unclassified	0.66	0.03
Play Ground	6.07	0.24	University	379.55	14.90
Police Station	0.15	0.01	Warehouse	0.76	0.03
Ponds	0.23	0.01	Water Treatment Plant	0.63	0.02
Primary/CHC	1.71	0.07	Waterlogged	0.93	0.04
Private Hospital	2.94	0.12	<b>Grand Total</b>	<b>2546.59</b>	<b>100</b>

### 3.3.26 PLANNING DISTRICT NO.26 – MAWPAT (CT)

**Area:** 888.35 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** BSF Camp, Mawpat Junction, Ishyrwat junction (Figure 3-31).

**General Description about the planning district:** Mawpat is a census town in Shillong characterized by a significant proportion of tree-clad areas, with 38.41% of the total land area. It also has a substantial amount of protected forests/notified forests, making up 27.71% of the area. Cropland for 10.30% of the area, while residential areas/colonies make up 6.61%. Cantonment/battalion is also present in the area, comprising 4.59% of the total land area (Table 3-29).

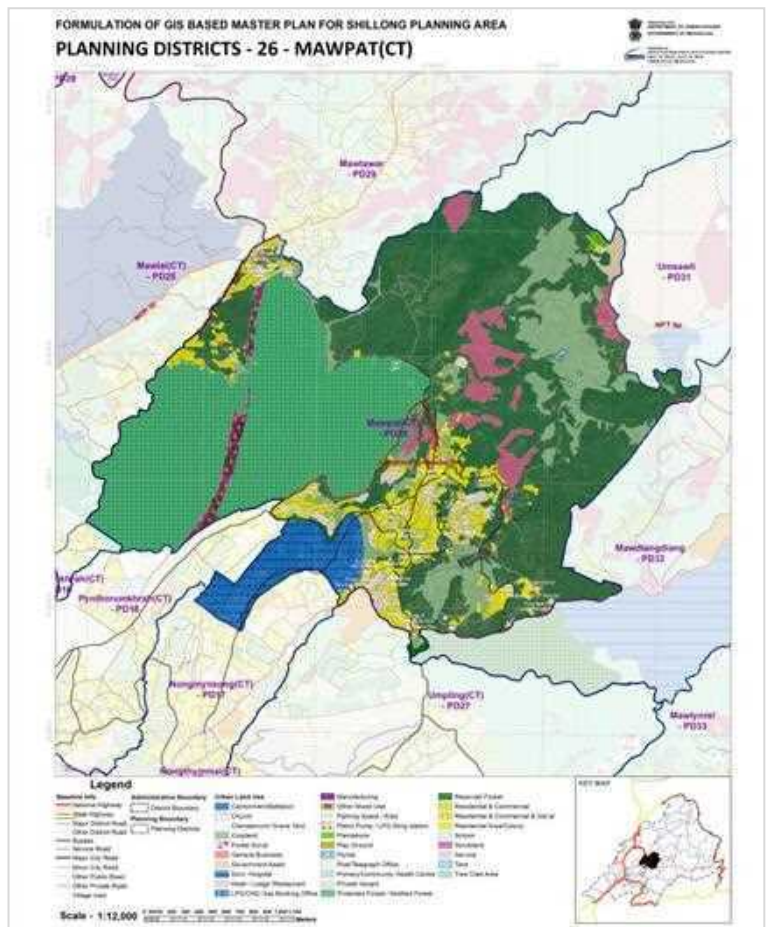


Table 3-29: Existing ULU - PD26 – Mawpat (CT)

Figure 3-31: Planning District – 26 – Mawpat (CT)

Mawpat(CT) - Categories	Area(Ha)	%age
Cantonment/Battalion	40.79	4.59
Church	1.03	0.12
Crematorium/ Grave Yard	1.26	0.14
Cropland	91.51	10.30
Forest Scrub	10.60	1.19
General Business	0.17	0.02
Government Asset	4.53	0.51

Mawpat(CT) - Categories	Area(Ha)	%age
Post/Telegraph Office	0.01	0.00
Private Vacant	21.57	2.43
Protected Forest / Notified F	246.20	27.71
Reserved Forest	0.94	0.11
Residential & Commercial	3.79	0.43
Residential & Commercial & Inst.al	0.03	0.00
Residential Area/Colony	58.69	6.61

Hotel / Lodge /Restaurant	1.07	0.12	School	0.63	0.07
LPG/CNG Gas Booking Office	0.02	0.00	Scrubland	37.66	4.24
Manufacturing	0.07	0.01	Service	0.07	0.01
Petrol Pump / LPG Filling Sta	0.15	0.02	Tank	0.07	0.01
Plantations	1.35	0.15	Traffic and Transportation	23.32	2.62
Play Ground	0.69	0.08	Tree Clad Area	341.18	38.41
Ponds	0.91	0.10	<b>Grand Total</b>	<b>888.35</b>	<b>100</b>

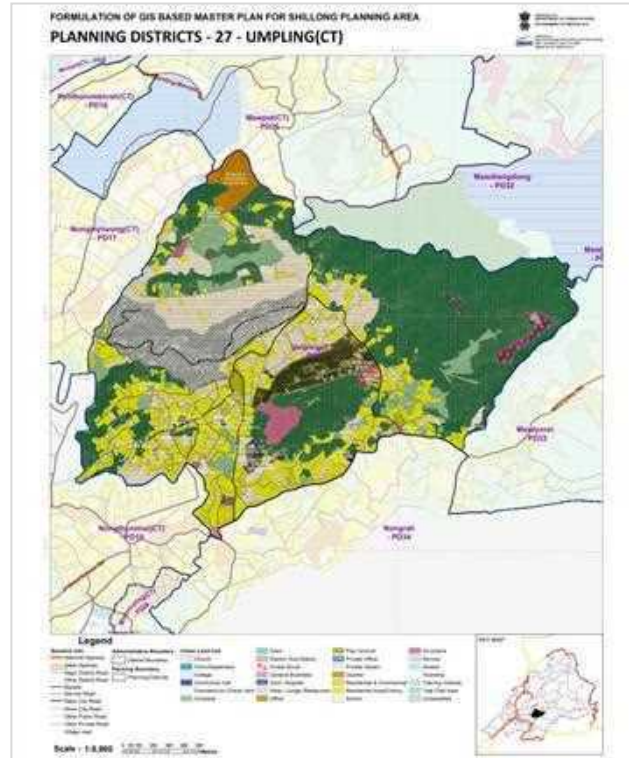
### 3.3.27 PLANNING DISTRICT NO.27 – UMPLING (CT)

**Area:** 444.82 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** Research & Development Establishment, Windermere Resort (*Figure 3-32*).

**General Description about the planning district:** In Umpling, the major land use types are residential areas/colonies (17.79%), tree-clad areas (39.03%), and private vacant lands (13.78%). Other significant land use types include cropland (5.90%), traffic and transportation (4.98%), and office spaces (1.65%). There are also areas of scrubland (1.15%), forest scrub (0.88%), and streams (0.19%) (*Table 3-30*).



**Figure 3-32: Planning District - 27 - Umpling (CT)**

**Table 3-30: Existing ULU - PD27 – Umpling (CT)**

Umpling(CT) - Categories	Area(Ha)	%age
Church	0.67	0.15
Clinic/Dispensary	0.02	0.01
College	0.26	0.06
Community hall	0.05	0.01
Crematorium/ Grave Yard	0.81	0.18
Cropland	26.24	5.90
Electric Sub-Station	0.09	0.02
Forest Scrub	3.90	0.88
General Business	0.67	0.15
Office	7.32	1.65
Play Ground	2.05	0.46
Private Office	0.08	0.02

Umpling(CT) - Categories	Area(Ha)	%age
Private Vacant	61.32	13.78
Residential & Commercial	5.84	1.31
Residential Area/Colony	79.13	17.79
School	2.03	0.46
Scrubland	5.13	1.15
Service	0.63	0.14
Stream	0.86	0.19
Township	13.56	3.05
Traffic and Transportation	22.15	4.98
Tree Clad Area	173.60	39.03
Unclassified	36.15	8.13
<b>Grand Total</b>	<b>444.82</b>	<b>100</b>

### 3.3.28 PLANNING DISTRICT NO.28 – MADANRITING (CT)

**Area:** 190.84 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** ITI, GSI, Ministry of Environment, Forest and Climate Change, Supercare Hospital, Rani Motors (Figure 3-33).

**General Description about the planning district:** Madanriting is a census town with a diverse land use pattern. The dominant land uses are residential areas/colonies (33.73%), followed by cropland (5.54%), private vacant land (5.26%), and residential & commercial areas (5.41%). Other significant land uses include offices (4.94%), traffic and transportation (6.38%), private hospitals (1.31%), and general business (1.94%). The town also has significant areas of fallow land (8.15%), tree-clad areas (20.98%), and scrubland (0.09%) (Table 3-31).

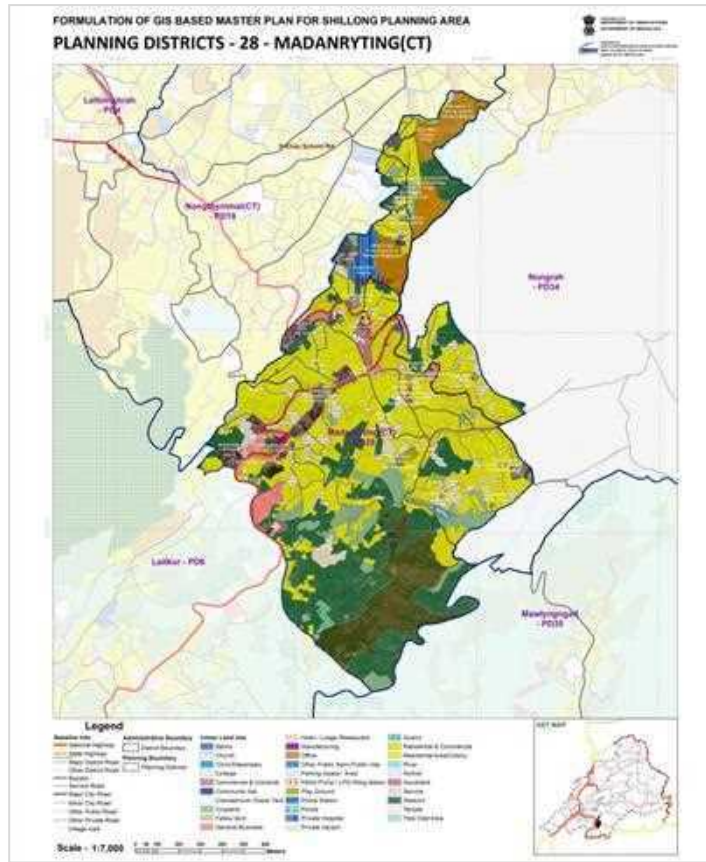


Figure 3-33: Planning District – 28 – Madanriting (CT)

Table 3-31: Existing ULU - PD28 – Madanriting (CT)

Madanriting(CT) - Categories	Area(Ha)	%age	Madanriting(CT) - Categories	Area(Ha)	%age
Banks	0.01	0.01	Police Station	0.08	0.04
Church	1.09	0.57	Ponds	0.23	0.12
Clinic/Dispensary	0.03	0.02	Private Hospital	2.51	1.31
College	0.02	0.01	Private Vacant	10.05	5.26
Commercial & Industrial	0.68	0.36	Quarry	0.50	0.26
Community hall	0.07	0.04	Residential & Commercial	10.33	5.41
Crematorium/ Grave Yard	0.56	0.29	Residential Area/Colony	64.37	33.73
Cropland	10.57	5.54	River	0.47	0.24
Fallow land	15.55	8.15	School	2.71	1.42
General Business	3.71	1.94	Scrubland	0.18	0.09
Hotel / Lodge /Restaurant	0.10	0.05	Service	4.36	2.29
Manufacturing	0.18	0.09	Stadium	0.07	0.04
Office	9.42	4.94	Temple	0.04	0.02
Other Public Semi-Public Use	0.01	0.01	Traffic and Transportation	12.18	6.38
Petrol Pump / LPG Filling Stat	0.29	0.15	Tree Clad Area	40.04	20.98
Play Ground	0.42	0.22	<b>Grand Total</b>	<b>190.84</b>	<b>100</b>

### 3.3.29 PLANNING DISTRICT NO.29 - MAWTAWAR

**Area:** 1666.72 Hectares

**Location:** Peripheral Area

**Major Landmarks:** Mawtawar Block Development Office, Bypass Junction, Mawtawar Presbyterian Church, Umsaw Mawjynrong Community Hall (Figure 3-34).

**General Description about the planning district:** Mawtawar has a high percentage of tree-clad areas (58.24%) and scrubland (19.01%). Cropland also makes up a significant portion of the area (14.13%), while residential areas and private vacant land each make up less than 3%. The area also has several water sources, including a river and a stream (Table 3-32).

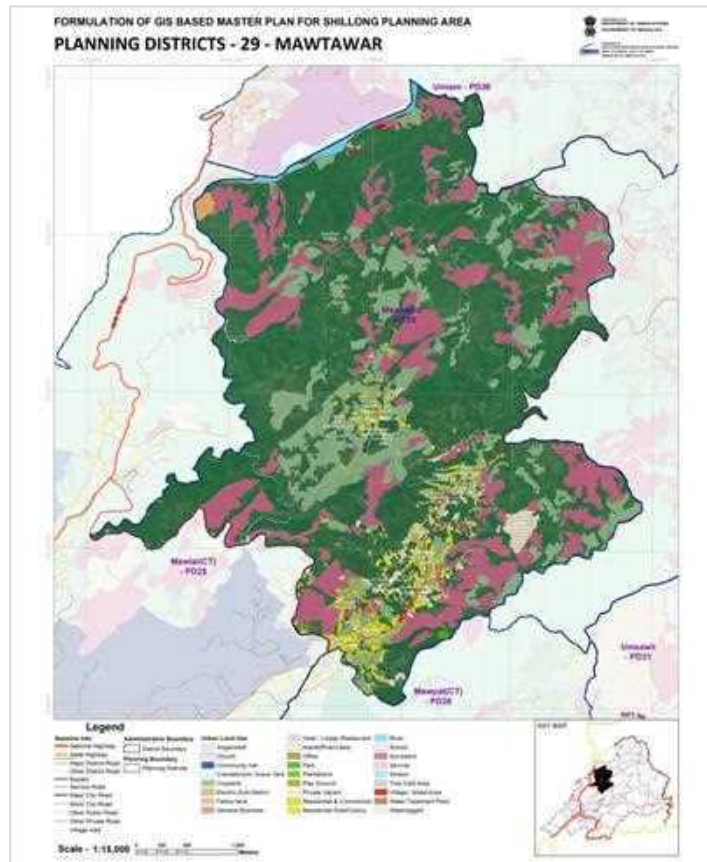


Figure 3-34: Planning District – 29 - Mawtawar

Table 3-32: Existing ULU - PD29 - Mawtawar

Mawtawar - Categories	Area(Ha)	%age	Mawtawar - Categories	Area(Ha)	%age
Anganwadi	0.03	0.00	Private Vacant	30.65	1.84
Church	0.99	0.06	Residential & Commercial	2.82	0.17
Community hall	0.06	0.00	Residential Area/Colony	45.43	2.73
Crematorium/ Grave Yard	0.13	0.01	River	8.58	0.51
Cropland	235.57	14.13	School	0.47	0.03
Electric Sub-Station	3.80	0.23	Scrubland	316.86	19.01
Fallow land	0.12	0.01	Service	0.19	0.01
General Business	0.04	0.00	Stream	7.17	0.43
Hotel / Lodge /Restaurant	0.06	0.00	Traffic and Transportation	34.57	2.07
Island(River/Lake)	0.57	0.03	Tree Clad Area	970.75	58.24
Office	0.04	0.00	Village / Abadi Area	1.88	0.11
Park	0.22	0.01	Water Treatment Plant	0.27	0.02
Plantations	1.18	0.07	Waterlogged	1.84	0.11
Play Ground	2.44	0.15	<b>Grand Total</b>	<b>1666.72</b>	<b>100</b>

### 3.3.30 PLANNING DISTRICT NO.30 - NONGKOHLEW

**Area:** 1303.26 Hectares

**Location:** Peripheral Area

**Major Landmarks:** Madan Nongkohlew Playground, Samuel Christian School, Don Bosco Nongkohlew Secondary School, Samuel Christian School  
(Figure 3-35).

**General Description about the planning district:** Nongkohlew has the highest percentage of scrubland (22.48%) and deforested area (3.42%), which implies that it has experienced significant land degradation due to human activities such as deforestation and shifting cultivation. It also has a high percentage of cropland (18.60%) (Table 3-33).

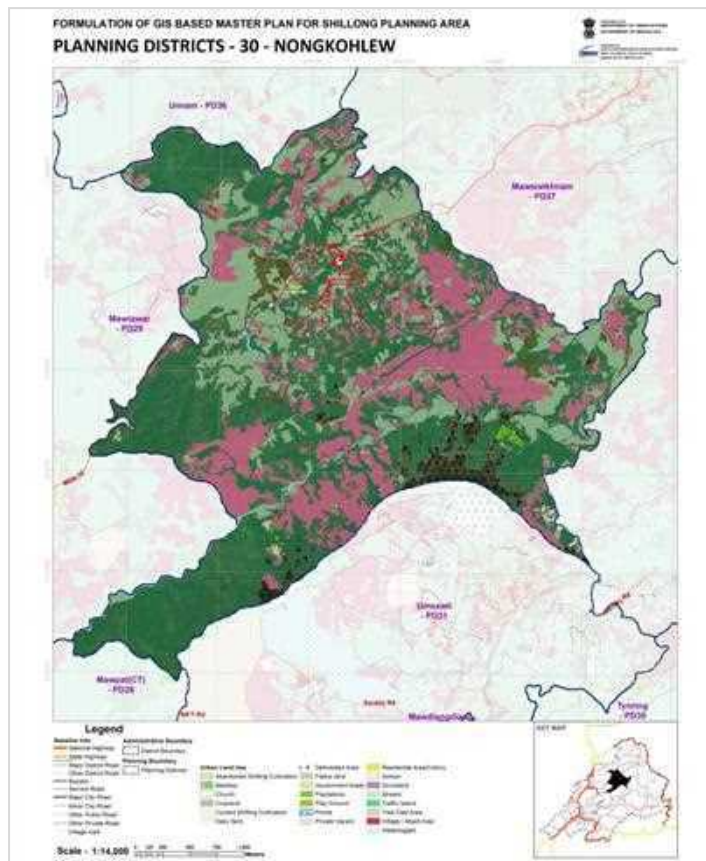


Figure 3-35: Planning District – 30 - Nongkohlew

Table 3-33: Existing ULU - PD30 - Nongkohlew

Nongkohlew - Categories	Area(Ha)	%age
Abandoned Shifting Cultivation	1.98	0.15
Bamboo	1.58	0.12
Church	0.22	0.02
Cropland	242.39	18.60
Current Shifting Cultivation	1.39	0.11
Dairy farm	0.16	0.01
Deforested Area	44.59	3.42
Fallow land	29.06	2.23
Government Asset	0.04	0.00
Plantations	2.00	0.15
Play Ground	0.63	0.05

Nongkohlew - Categories	Area(Ha)	%age
Ponds	1.96	0.15
Private Vacant	0.98	0.08
Residential Area/Colony	0.05	0.00
School	0.53	0.04
Scrubland	292.91	22.48
Stream	8.39	0.64
Traffic and Transportation	14.53	1.11
Tree Clad Area	650.54	49.92
Village / Abadi Area	9.28	0.71
Waterlogged	0.05	0.00
<b>Grand Total</b>	<b>1303.26</b>	<b>100</b>

### 3.3.31 PLANNING DISTRICT NO.31 - UMSAWLI

**Area:** 733.72 Hectares

**Location:** Peripheral Area

**Major Landmarks:** IIM Shillong, NIFT, TB Hospital (*Figure 3-36*).

**General Description about the planning district:** The major land use types are government assets (9.94%), tree clad area (34.39%), and traffic and transportation (3.05%). Other significant land use types include current shifting cultivation (1.67%), cropland (7.63%), and deforested area (4.57%). The area also has scrubland (18.56%), private vacant land (2.51%), and fallow land (3.81%). The rest of the land use types have relatively smaller percentages (*Table 3-34*).

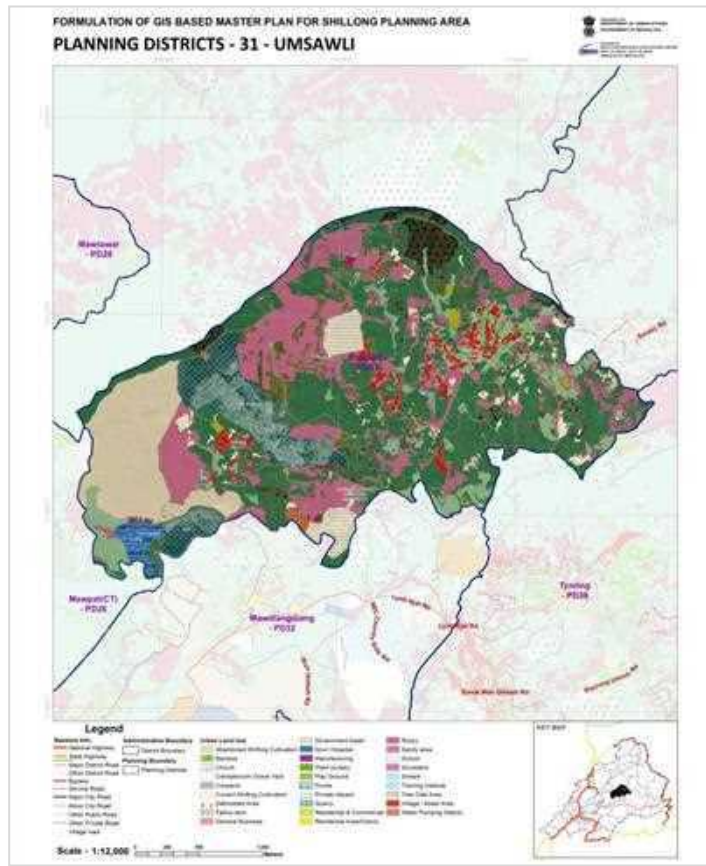


Figure 3-36: Planning District – 31 – Umsawli

Table 3-34: Existing ULU - PD31 - Umsawli

Umsawli - Categories	Area(Ha)	%age
Abandoned Shifting Cultivation	1.94	0.26
Bamboo	3.85	0.52
Church	0.58	0.08
Crematorium/ Grave Yard	0.23	0.03
Cropland	55.98	7.63
Current Shifting Cultivation	12.25	1.67
Deforested Area	33.50	4.57
Fallow land	27.92	3.81
General Business	0.05	0.01
Government Asset	72.90	9.94
Govt. Hospital	7.81	1.06
Manufacturing	0.39	0.05
Plant nursery	0.01	0.00
Play Ground	2.53	0.35
Ponds	0.98	0.13

Umsawli - Categories	Area(Ha)	%age
Private Vacant	18.42	2.51
Quarry	0.47	0.06
Residential & Commercial	0.15	0.02
Residential Area/Colony	0.15	0.02
Rocky	0.17	0.02
Sandy area	0.01	0.00
School	0.29	0.04
Scrubland	136.16	18.56
Stream	1.73	0.24
Traffic and Transportation	22.38	3.05
Training Institute	60.12	8.19
Tree Clad Area	252.30	34.39
Village / Abadi Area	18.37	2.50
Water Pumping Station	2.08	0.28
<b>Grand Total</b>	<b>733.72</b>	<b>100</b>

### 3.3.32 PLANNING DISTRICT NO.32 - MAWDIANGDIANG

**Area:** 627.03 Hectares

**Location:** Peripheral Area

**Major Landmarks:** NEIGRIHMS, Legislative Assembly Building, IIHM, Juvenile Home (Figure 3-37).

**General Description about the planning district:** The land use is dominated by the government hospital, reserved forest, and tree-clad areas with 18.08%, 7.06%, and 30.72% respectively. Other significant land uses are township, traffic and transportation, office, and deforested area. Cropland and fallow land have a relatively small percentage of land use (Table 3-35).

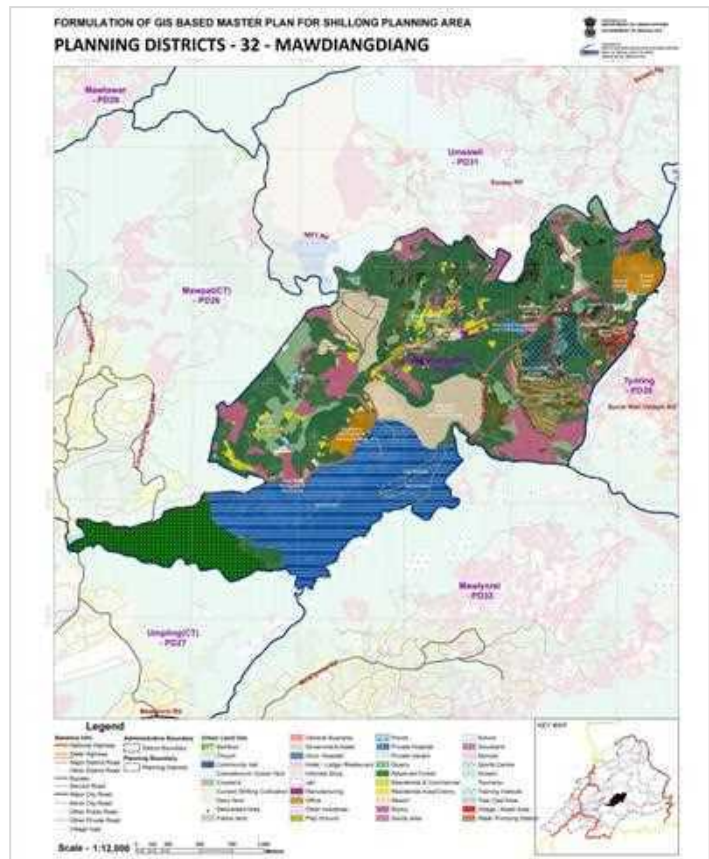


Table 3-35: Existing ULU - PD32 - Mawdiangdiang

Mawdiangdiang - Categories	Area(Ha)	%age
Bamboo	1.25	0.20
Church	0.04	0.01
Community hall	0.04	0.01
Crematorium/ Grave Yard	1.12	0.18
Cropland	28.19	4.50
Dairy farm	0.28	0.05
Deforested Area	14.15	2.26
Fallow land	8.59	1.37
General Business	0.59	0.09
Government Asset	43.53	6.94
Govt. Hospital	113.35	18.08
Hotel / Lodge /Restaurant	0.14	0.02
Informal Shop	0.23	0.04
Jail	3.55	0.57
Manufacturing	0.47	0.08
Office	16.08	2.56
Other Industries	0.95	0.15
Play Ground	0.66	0.11
Ponds	1.06	0.17

Figure 3-37: Planning District – 32 - Mawdiangdiang

Mawdiangdiang - Categories	Area(Ha)	%age
Private Hospital	1.25	0.20
Private Vacant	6.84	1.09
Quarry	1.75	0.28
Reserved Forest	44.24	7.06
Residential & Commercial	0.96	0.15
Residential Area/Colony	12.22	1.95
Resort	2.72	0.43
Sandy area	0.33	0.05
School	2.57	0.41
Scrubland	59.76	9.53
Service	0.15	0.02
Sports Centre	0.21	0.03
Stream	3.18	0.51
Township	19.53	3.11
Traffic and Transportation	27.50	4.39
Training Institute	15.91	2.54
Tree Clad Area	192.61	30.72
Village / Abadi Area	0.94	0.15
<b>Grand Total</b>	<b>627.03</b>	<b>100</b>

### 3.3.33 PLANNING DISTRICT NO.33 - MAWLYNREI

**Area:** 844.95 Hectares

**Location:** Peripheral Area

**Major Landmarks:** Laitlyngkot waterfall, Phudmuri Falls, Mawlynrei Falls, St. Agnes's Secondary School (Figure 3-38).

**General Description about the planning district:** The land use table for Mawlynrei shows that the area is predominantly covered by tree clad areas (55.65%), followed by croplands (8.22%), and scrubland (12.42%). The area also has a significant proportion of deforested land (6.48%) and abandoned shifting cultivation (1.65%). There are also small percentages of residential and commercial areas, streams, ponds, and quarries (Table 3-36).

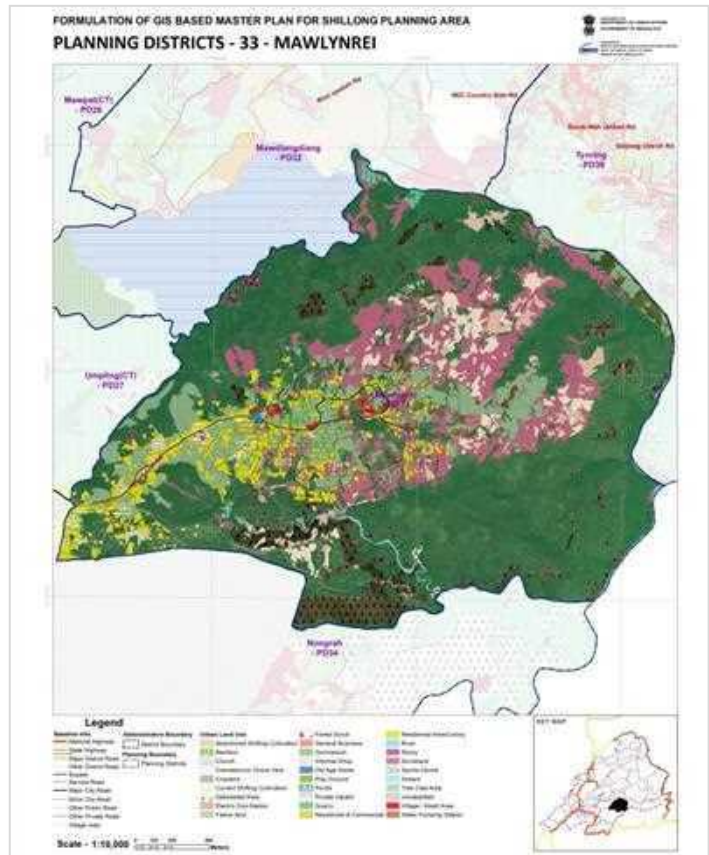


Table 3-36: Existing ULU - PD33 - Mawlynrei

Mawlynrei - Categories	Area(Ha)	%age
Abandoned Shifting Cultivation	13.95	1.65
Bamboo	5.46	0.65
Church	0.63	0.07
Crematorium/ Grave Yard	0.95	0.11
Cropland	69.46	8.22
Current Shifting Cultivation	26.50	3.14
Deforested Area	54.79	6.48
Electric Sub-Station	0.06	0.01
Fallow land	18.10	2.14
Forest Scrub	2.20	0.26
General Business	0.03	0.00
Gymnasium	0.07	0.01
Informal Shop	0.09	0.01
Old Age Home	0.36	0.04
Play Ground	1.43	0.17

Figure 3-38: Planning District – 33 - Mawlynrei

Mawlynrei - Categories	Area(Ha)	%age
Ponds	0.30	0.04
Private Vacant	4.44	0.53
Quarry	3.01	0.36
Residential & Commercial	0.28	0.03
Residential Area/Colony	42.32	5.01
River	1.09	0.13
Rocky	0.38	0.04
Scrubland	104.98	12.42
Sports Centre	0.09	0.01
Stream	5.10	0.60
Traffic and Transportation	16.52	1.96
Tree Clad Area	470.23	55.65
Unclassified	0.00	0.00
Village / Abadi Area	2.09	0.25
Water Pumping Station	0.02	0.00
<b>Grand Total</b>	<b>844.95</b>	<b>100</b>



### 3.3.34 PLANNING DISTRICT NO.34 - NONGRAH

**Area:** 1095.52 Hectares

**Location:** Peripheral Area

**Major Landmarks:** Power System Operation Corporation Ltd. (NERLDC), Martin Luther Christian University, Sweet Falls View Point (*Figure 3-39*).

**General Description about the planning district:** Cropland is the largest category at 10.91%, followed by unclassified land at 43.67%. Tree Clad Area is at 20.38%, and Residential Area/Colony is at 5.98%. Deforested Area is at 4.90%, and Scrubland is at 5.18%. Other categories include abandoned and current shifting cultivation, dairy farm, quarry, river, and traffic and transportation (*Table 3-37*).

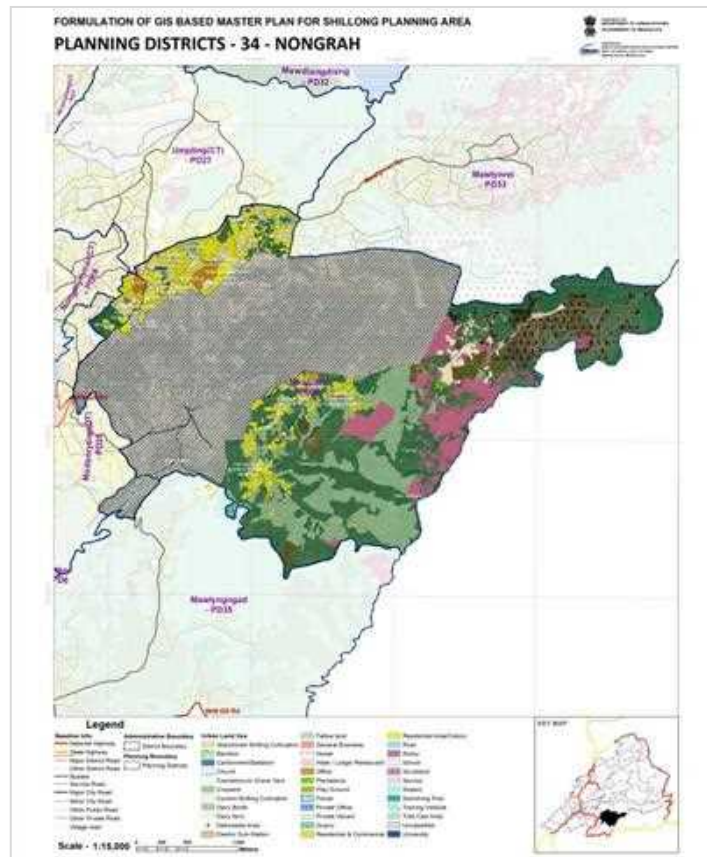


Table 3-37: Existing ULU - PD34 - Nongrah

Nongrah - Categories	Area(Ha)	%age
Abandoned Shifting Cultivation	2.34	0.21
Cantonment/Battalion	0.06	0.01
Church	0.89	0.08
Crematorium/ Grave Yard	0.37	0.03
Cropland	119.56	10.91
Current Shifting Cultivat	8.74	0.80
Dairy Booth	0.01	0.00
Dairy farm	0.14	0.01
Deforested Area	53.66	4.90
Electric Sub-Station	0.41	0.04
Fallow land	23.87	2.18
General Business	0.54	0.05
Hostel	0.76	0.07
Hotel / Lodge /Restaurant	0.41	0.04
Office	5.85	0.53
Plantations	0.72	0.07
Play Ground	1.82	0.17

Figure 3-39: Planning District – 34 - Nongrah

Nongrah - Categories	Area(Ha)	%age
Ponds	0.19	0.02
Private Vacant	14.37	1.31
Quarry	3.76	0.34
Residential & Commercial	2.78	0.25
Residential Area/Colony	65.47	5.98
River	5.55	0.51
Rocky	2.42	0.22
School	1.26	0.12
Scrubland	56.78	5.18
Service	0.07	0.01
Stream	1.32	0.12
Traffic and Transportation	18.97	1.73
Training Institute	0.06	0.01
Tree Clad Area	223.32	20.38
Unclassified	478.37	43.67
University	0.54	0.05
<b>Grand Total</b>	<b>1095.52</b>	<b>100</b>

### 3.3.35 PLANNING DISTRICT NO.35 - MAWPYNTHIH

**Area:** 909.82 Hectares

**Location:** Peripheral Area

**Major Landmarks:** St Mary Mozzarella Catholic Church, Umphyrnai sub health centre, RLG E-Waste Collection Centre (Figure 3-40).

**General Description about the planning district:** Mawpynthih has a predominantly agricultural landscape, with cropland covering 33.60% of the area. Tree clad areas cover 55.22% and Scrubland covers 0.98%. The area also has a significant quarry, accounting for 3.06% of the land. There are also some residential areas and commercial establishments, but they make up a relatively small percentage of the land (Table 3-38).

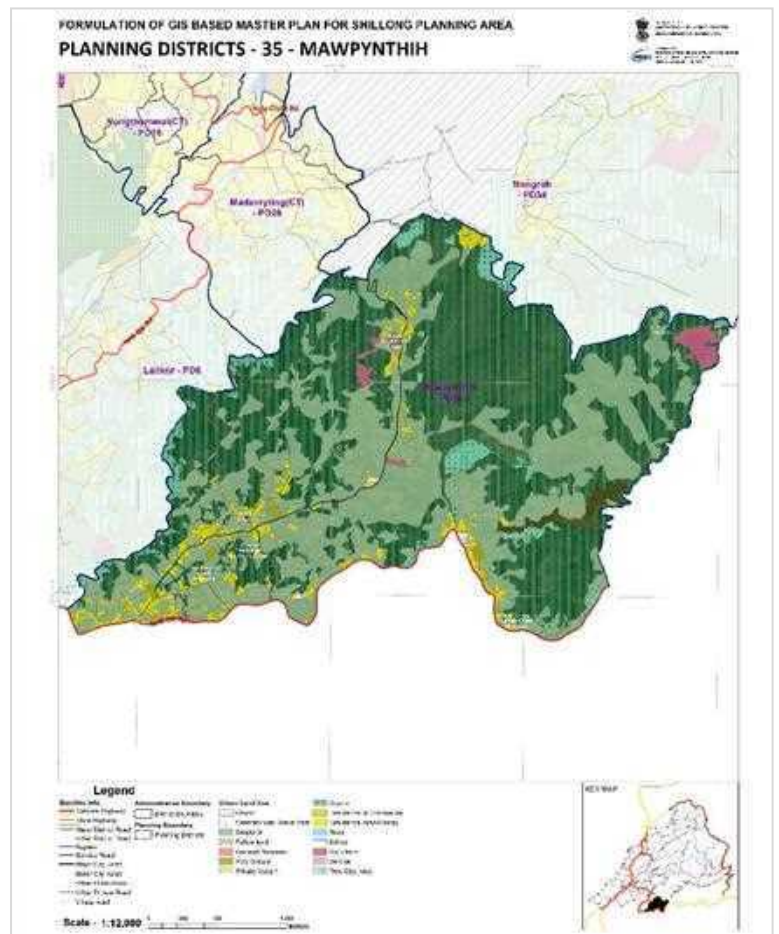


Figure 3-40: Planning District – 35 - Mawpynthih

Table 3-38: Existing ULU - PD35 - Mawpynthih

Mawlyngngad - Categories	Area(Ha)	%age
Church	1.20	0.13
Crematorium/ Grave Yard	0.07	0.01
Cropland	305.71	33.60
Fallow land	8.21	0.90
General Business	0.21	0.02
Play Ground	2.36	0.26
Private Vacant	1.39	0.15
Quarry	27.83	3.06
Residential & Commercial	3.09	0.34
Residential Area/Colony	30.18	3.32
River	4.67	0.51
School	0.68	0.07
Scrubland	8.87	0.98
Service	0.19	0.02
Traffic and Transportation	12.79	1.41
Tree Clad Area	502.38	55.22
<b>Grand Total</b>	<b>909.82</b>	<b>100</b>

### 3.3.36 PLANNING DISTRICT NO.36 – UMIAM

**Area:** 736.93 Hectares

**Location:** Peripheral Area

**Major Landmarks:** NESAC, NERIE, Orchid Lake Resort, Umiam Dam, Nehru Park (Figure 3-41).

**General Description about the planning district:** The land use distribution in Umiam includes cropland (10.63%), manufacturing (10.28%), scrubland (10.29%), tree clad area (54.15%), and other categories such as traffic and transportation (2.05%), training institute (1.81%), quarter (2.58%), and village/abadi area (1.47%). The land is also used for various other purposes such as electric sub-station, garden, government asset, park, playground, private vacant, residential area/colony, river, school, sports centre, stream, temple, and dam, with their percentages ranging from 0.01% to 3.71% (Table 3-39).

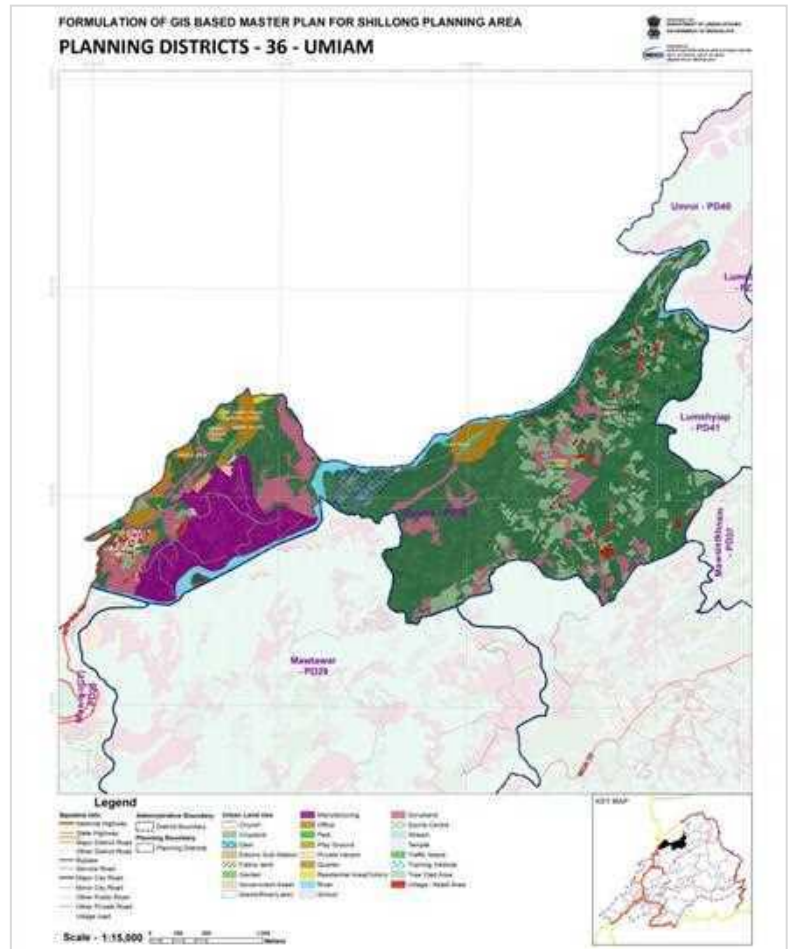


Figure 3-41: Planning District – 36 - Umiam

Table 3-39: Existing ULU - PD36 - Umiam

Umiam - Categories	Area(Ha)	%age	Umiam - Categories	Area(Ha)	%age
Church	0.41	0.06	Quarter	18.99	2.58
Cropland	78.37	10.63	Residential Area/Colony	0.82	0.11
Dam	0.32	0.04	River	27.31	3.71
Electric Sub-Station	1.16	0.16	School	0.08	0.01
Fallow land	0.63	0.08	Scrubland	75.85	10.29
Garden	1.30	0.18	Sports Centre	0.21	0.03
Government Asset	1.03	0.14	Stream	0.78	0.11
Island(River/Lake)	1.46	0.20	Temple	0.14	0.02
Manufacturing	75.76	10.28	Traffic and Transportation	15.10	2.05
Office	9.37	1.27	Training Institute	13.31	1.81
Park	0.74	0.10	Tree Clad Area	399.08	54.15
Play Ground	1.67	0.23	Village / Abadi Area	10.84	1.47
Private Vacant	2.21	0.30	<b>Grand Total</b>	<b>736.93</b>	<b>100</b>

### 3.3.37 PLANNING DISTRICT NO.37 – UMSARANG

**Area:** 1046.67 Hectares

**Location:** Peripheral Area

**Major Landmarks:** St. Mark Church, Mawsiatkhnam Public Health Centre (Figure 3-42).

**General Description about the planning district:** Umsarang land use is dominated by cropland, which covers over 34% of the area, followed by tree-clad areas at 40.21%. Scrubland and fallow land cover 17.01% and 3.19%, respectively. Other notable land uses include traffic and transportation at 2.36% and village/abadi area at 2.05%. There are also small percentages of play grounds, ponds, primary/community health centres, and schools (Table 3-40).

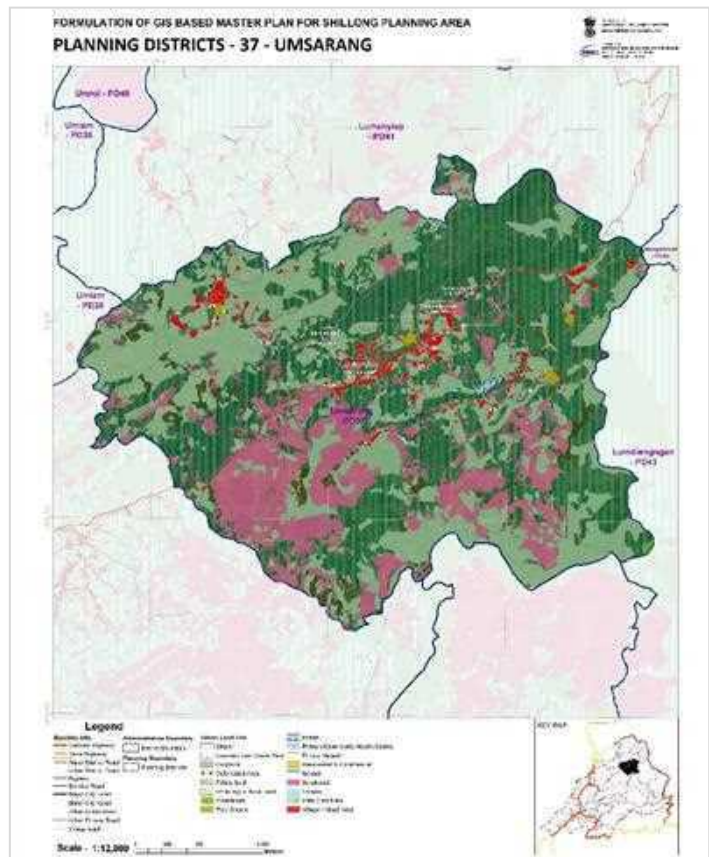


Figure 3-42: Planning District – 37 - Umsarang

Table 3-40: Existing ULU - PD37 - Umsarang

Umsarang - Categories	Area(Ha)	%age
Church	0.59	0.06
Crematorium/ Grave Yard	0.19	0.02
Cropland	356.64	34.07
Deforested Area	0.18	0.02
Fallow land	33.40	3.19
Other Agriculture Land	0.24	0.02
Plantations	0.50	0.05
Play Ground	2.73	0.26
Ponds	2.57	0.25
Primary/Community Health Centre	0.65	0.06
Private Vacant	2.07	0.20
School	1.06	0.10
Scrubland	178.08	17.01
Stream	0.69	0.07
Traffic and Transportation	24.69	2.36
Tree Clad Area	420.85	40.21
Village / Abadi Area	21.43	2.05
<b>Grand Total</b>	<b>1046.67</b>	<b>100</b>

### 3.3.38 PLANNING DISTRICT NO.38 - SAISIEJ

**Area:** 960.38 Hectares

**Location:** Peripheral Area

**Major Landmarks:** New Shillong Techno Site, Saisiej Catholic Church (Figure 3-43).

**General Description about the planning district:** The major land uses are cropland (23.63%), scrubland (32.10%), tree-clad area (32.86%), and current shifting cultivation (1.59%). Other land uses include abandoned shifting cultivation, bamboo, crematorium/graveyard, deforested area, electric sub-station, fallow land, informal shop, playground, ponds, private vacant, rocky, sandy area, school, stream, traffic and transportation, and village/abadi area (Table 3-41).

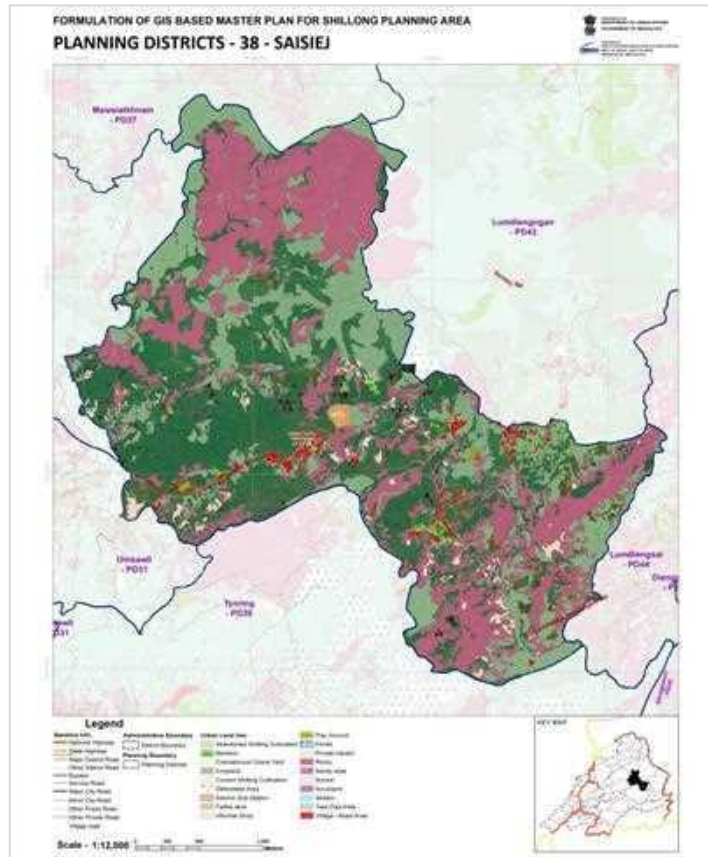


Table 3-41: Existing ULU - PD38 - Saisiej

Figure 3-43: Planning District – 38 - Saisiej

Saisiej - Categories	Area(Ha)	%age
Abandoned Shifting Cultivation	2.64	0.27
Bamboo	9.35	0.97
Crematorium/ Grave Yard	0.14	0.01
Cropland	226.94	23.63
Current Shifting Cultivation	15.27	1.59
Deforested Area	19.79	2.06
Electric Sub-Station	2.54	0.26
Fallow land	30.59	3.18
Play Ground	0.96	0.10
Ponds	0.08	0.01
Private Vacant	0.03	0.00
Sandy area	0.10	0.01
School	0.68	0.07
Scrubland	308.23	32.10
Stream	5.71	0.59
Traffic and Transportation	10.75	1.12
Tree Clad Area	315.59	32.86
Village / Abadi Area	10.95	1.14
<b>Grand Total</b>	<b>960.38</b>	<b>100</b>

### 3.3.39 PLANNING DISTRICT NO.39 - MAWPDANG

**Area:** 1843.90 Hectares

**Location:** Peripheral Area

**Major Landmarks:** Franciscan Outreach, Vendrame Training Institute, Nela Handloom Centre, Tynring Presbyterian School (Figure 3-44).

**General Description about the planning district:** In Mawpdang, cropland covers 7.31% of the area, while deforested land covers 7.11% and scrubland covers 15.94%. Tree-clad areas make up the largest portion of the land at 51.54%. Additionally, there are various types of buildings and infrastructure, including bamboo plantations, churches, schools, and government assets. Traffic and transportation cover 2.87% of the area, and there are some ponds, streams, and a river (Table 3-42).

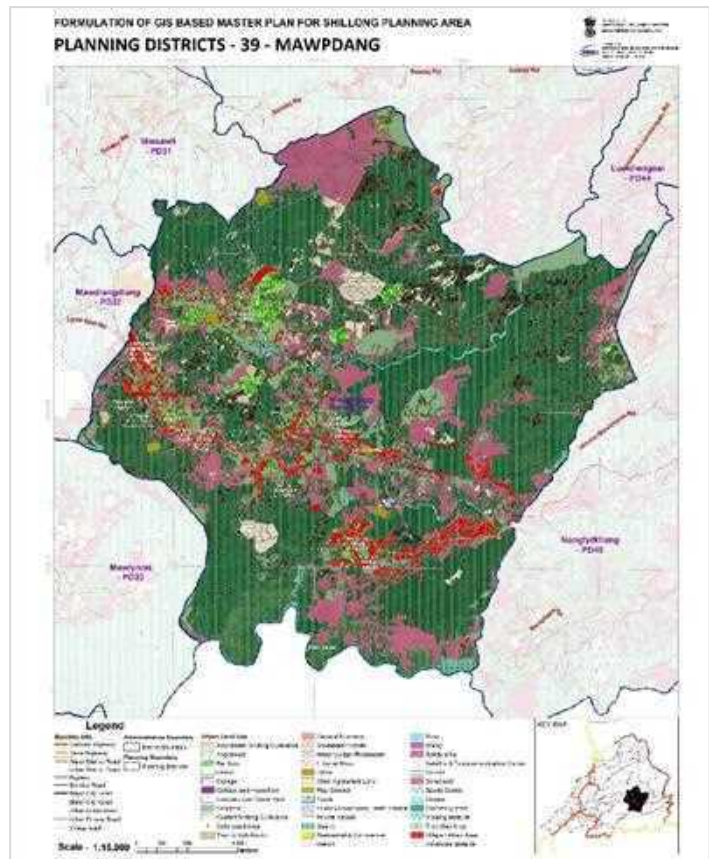


Figure 3-44: Planning District – 39 - Mawpdang

Table 3-42: Existing ULU - PD39 - Mawpdang

Tynring - Categories	Area(Ha)	%age
Abandoned Shifting Cultivation	11.66	0.63
Anganwadi	0.08	0.00
Bamboo	50.83	2.76
Church	2.45	0.13
College	3.21	0.17
Cottage and Household	0.34	0.02
Crematorium/ Grave Yard	1.08	0.06
Cropland	134.82	7.31
Current Shifting Cultivation	26.59	1.44
Deforested Area	131.11	7.11
Electric Sub-Station	0.15	0.01
Fallow land	43.55	2.36
General Business	1.53	0.08
Government Asset	0.24	0.01
Hotel / Lodge /Restaurant	0.31	0.02
Office	0.85	0.05
Other Agriculture Land	0.01	0.00
Play Ground	7.18	0.39
Ponds	3.20	0.17

Tynring - Categories	Area(Ha)	%age
Primary/CHC	0.10	0.01
Private Vacant	14.23	0.77
Quarry	12.39	0.67
Residential & Commercial	0.83	0.04
Resort	2.01	0.11
River	5.36	0.29
Rocky	0.15	0.01
Sandy area	0.66	0.04
Satellite & Telecom Center	0.37	0.02
School	2.30	0.12
Scrubland	293.83	15.94
Sports Centre	0.33	0.02
Stream	12.24	0.66
Traffic and Transportation	53.00	2.87
Training Institute	0.12	0.01
Tree Clad Area	950.39	51.54
Village / Abadi Area	74.90	4.06
Vocational Institute	1.40	0.08
<b>Grand Total</b>	<b>1843.90</b>	<b>100</b>

### 3.3.40 PLANNING DISTRICT NO.40 - UMROI

**Area:** 1125.24 Hectares

**Location:** Peripheral Area

**Major Landmarks:** Shillong Airport, Holy Redeemer Renewal Centre, Tyndai Resort, Iew San Shnong (Figure 3-45).

**General Description about the planning district:** Umroi has a variety of land uses, with cropland being the most common at 30.10% followed by scrubland at 27.97%. Other significant land uses include airport/airstrip at 15.69%, tree clad area at 13.54%, and traffic and transportation at 2.23%. The Table 3-43 also has a significant amount of waterlogged land at 1.94%. Private vacant land is present at 1.02%. The area has several water features, including rivers and ponds, and a few buildings such as churches, schools, and resorts.

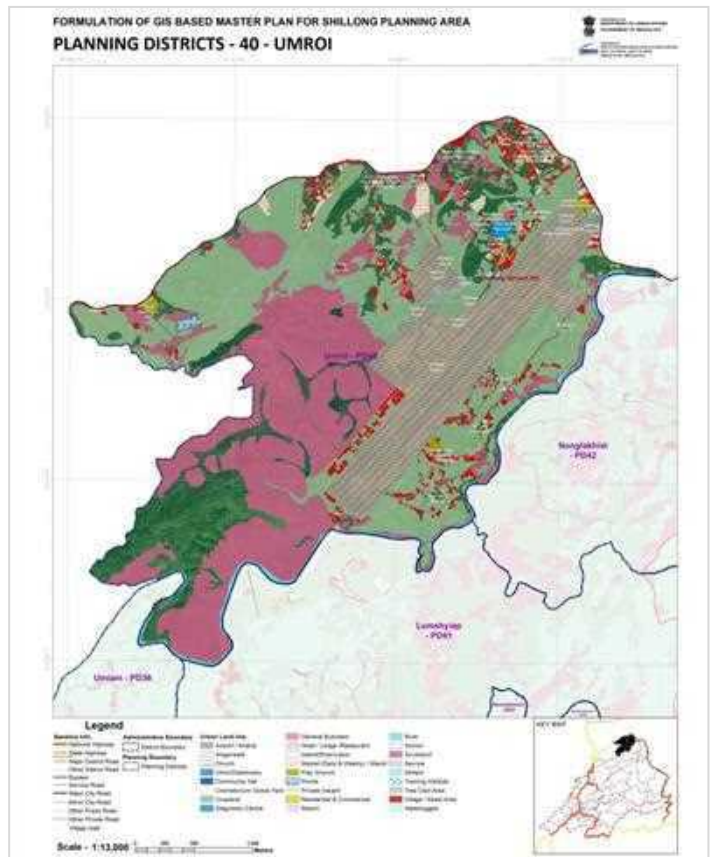


Figure 3-45: Planning District – 40 - Umroi

Table 3-43: Existing ULU - PD40 - Umroi

Umroi - Categories	Area(Ha)	%age
Airport / Airstrip	176.55	15.69
Anganwadi	0.02	0.00
Church	1.07	0.10
Clinic/Dispensary	0.03	0.00
Community hall	0.04	0.00
Crematorium/ Grave Yard	1.08	0.10
Cropland	338.72	30.10
Diagnostic Centre	1.97	0.17
General Business	0.16	0.01
Hotel / Lodge /Restaurant	0.87	0.08
Island(River/Lake)	0.70	0.06
Market (Daily & Weekly) / Mandi	0.89	0.08
Play Ground	3.46	0.31
Ponds	3.56	0.32

Umroi - Categories	Area(Ha)	%age
Private Vacant	11.51	1.02
Residential & Commercial	2.39	0.21
Resort	0.74	0.07
River	15.64	1.39
School	4.10	0.36
Scrubland	314.77	27.97
Service	0.58	0.05
Stream	6.45	0.57
Traffic and Transportation	25.12	2.23
Training Institute	0.72	0.06
Tree Clad Area	152.39	13.54
Village / Abadi Area	39.92	3.55
Waterlogged	21.78	1.94
<b>Grand Total</b>	<b>1125.24</b>	<b>100</b>

### 3.3.41 PLANNING DISTRICT NO.41 - LUMSHYIAP

**Area:** 775.90 Hectares

**Location:** Peripheral Area

**Major Landmarks:** Umrynjah Health Sub-Centre, Umjathang, Lumshyiap (Figure 3-46).

**General Description about the planning district:** Majority of the land is covered by tree-clad areas (47.38%) and croplands (36.01%). Other significant land uses include traffic and transportation (2.01%), river (0.87%), and scrubland (9.73%). There are also various small land uses such as churches, playgrounds, and resorts. Additionally, there is a small portion of land that is waterlogged (0.39%) (Table 3-44).

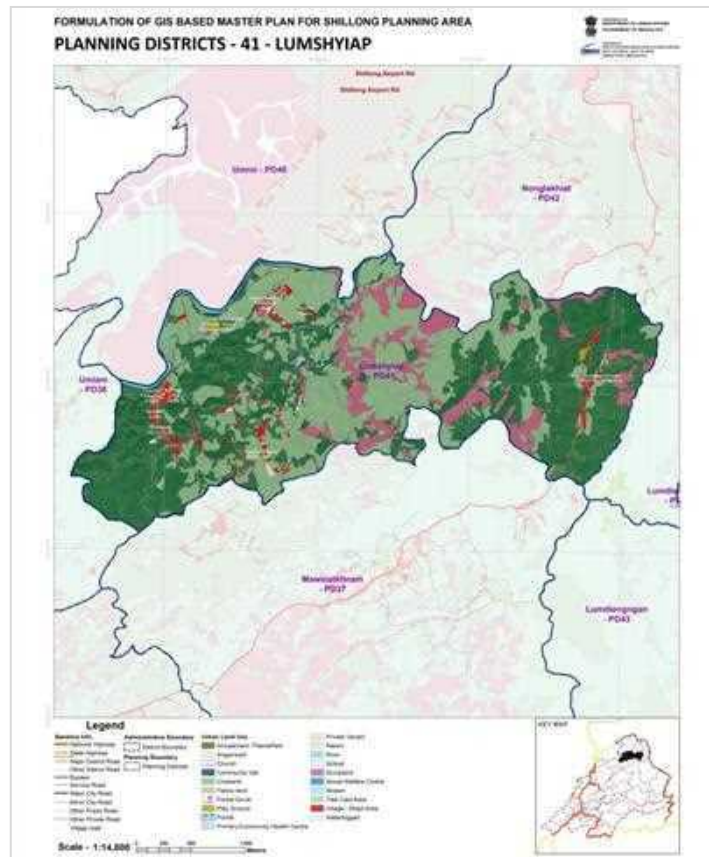


Figure 3-46: Planning District – 41 - Lumshyiap

Table 3-44: Existing ULU - PD41 - Lumshyiap

Lumshyiap - Categories	Area(Ha)	%age
Amusement /Theme Park	0.32	0.04
Church	1.01	0.13
Cropland	279.40	36.01
Fallow land	1.83	0.24
Forest Scrub	0.59	0.08
Play Ground	1.71	0.22
Ponds	1.98	0.26
Primary/CHC	0.08	0.01
Private Vacant	2.17	0.28
Resort	1.05	0.14
River	6.76	0.87
School	0.52	0.07
Scrubland	75.52	9.73
Stream	1.51	0.19
Traffic and Transportation	15.59	2.01
Tree Clad Area	367.64	47.38
Village / Abadi Area	14.96	1.93
Waterlogged	3.04	0.39
<b>Grand Total</b>	<b>775.90</b>	<b>100</b>



### 3.3.42 PLANNING DISTRICT NO.42 - NONGLAKHIAT

**Area:** 1007.49 Hectares

**Location:** Peripheral Area

**Major Landmarks:** Don Bosco Aspirantate, Fire Bridge, Office of Eastern Ri Bhoi Organic FPC (Figure 3-47).

**General Description about the planning district:** Nonglakhiat has a large percentage of cropland, with 52.84% of the area being used for this purpose. Other notable land uses include scrubland (13.44%), tree-clad area (26.61%), and a significant portion (0.58%) being used as a resort. The area also has some plantations, playgrounds, and ponds. The percentage of land used for residential and commercial purposes is relatively low at 0.23% (Table 3-45).

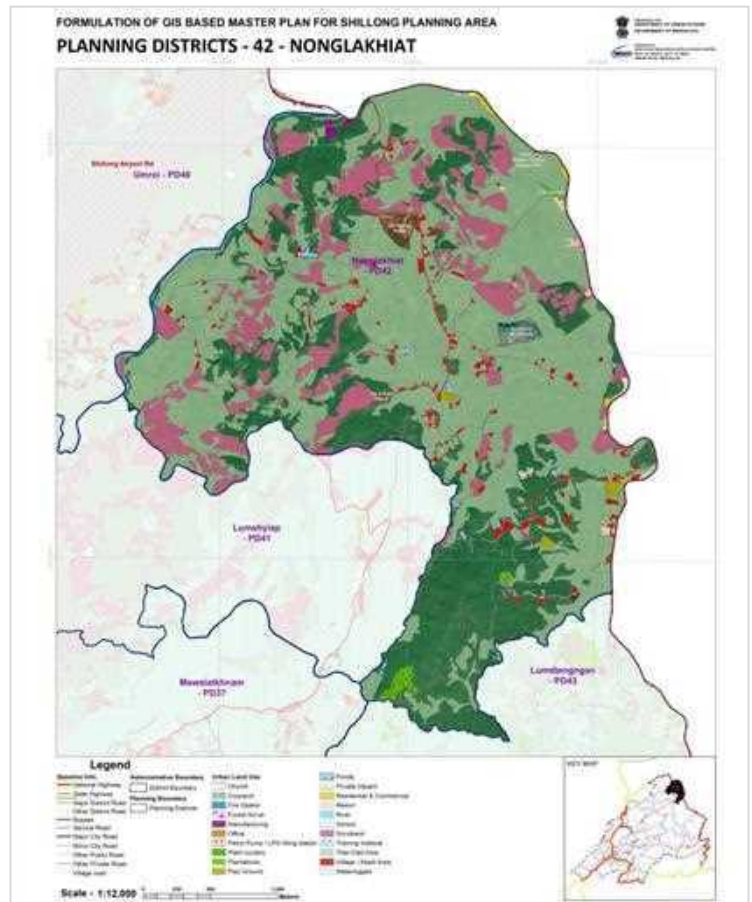


Table 3-45: Existing ULU - PD42 - Nonglakhiat

Figure 3-47: Planning District – 42 - Nonglakhiat

Nonglakhiat - Categories	Area(Ha)	%age
Cropland	532.32	52.84
Fire Station	0.07	0.01
Manufacturing	1.10	0.11
Petrol Pump / LPG Filling Station	0.64	0.06
Plant nursery	0.59	0.06
Plantations	3.96	0.39
Play Ground	2.40	0.24
Ponds	3.60	0.36
Private Vacant	3.03	0.30
Residential & Commercial	2.28	0.23
Resort	5.80	0.58
River	4.69	0.47
School	0.27	0.03
Scrubland	135.42	13.44
Traffic and Transportation	19.62	1.95
Training Institute	4.74	0.47
Tree Clad Area	268.11	26.61
Village / Abadi Area	17.12	1.70
<b>Grand Total</b>	<b>1007.49</b>	<b>100</b>

### 3.3.43 PLANNING DISTRICT NO.43 - LUMDIENGNAN

**Area:** 1464.37 Hectares

**Location:** Peripheral Area

**Major Landmarks:** Wansuk & Leitsuk, Rangmen, Wahmyntait (*Figure 3-48*).

**General Description about the planning district:** The major land use in Lumdiengnan seems to be tree-clad areas, accounting for 50.73% of the total land. Croplands are also present, covering 31.61% of the land. Other land uses include plantations (5.68%), scrublands (7.88%), deforested areas (0.53%), and traffic and transportation (1.04%) (*Table 3-46*).

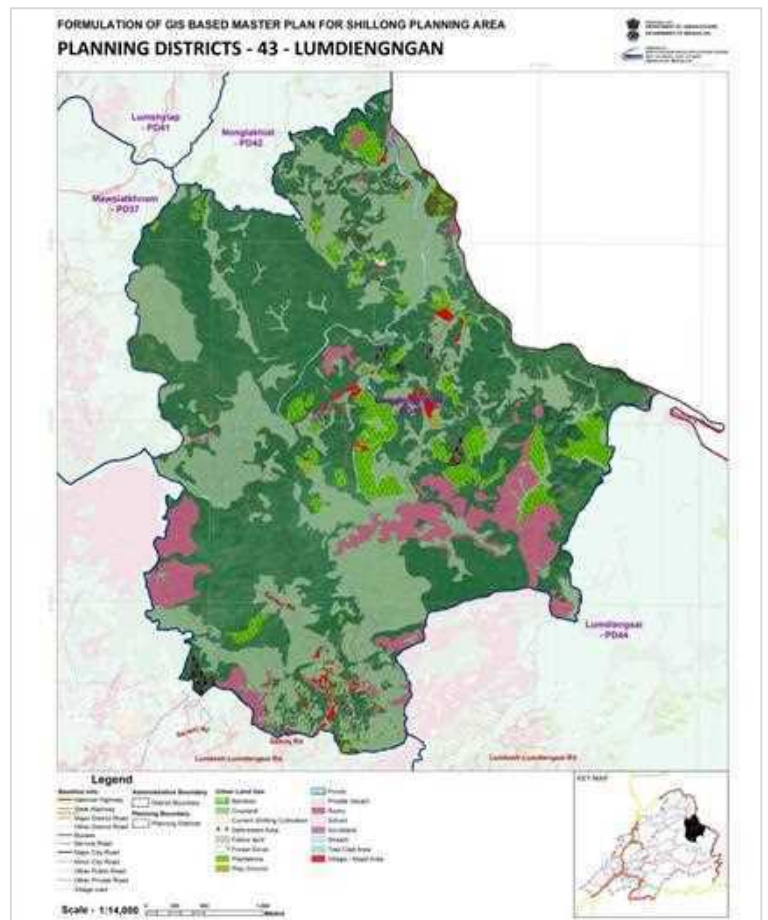


Figure 3-48: Planning District – 43 - Lumdiengnan

Table 3-46: Existing ULU - PD43 - Lumdiengnan

Lumdiengnan - Categories	Area(Ha)	%age
Bamboo	3.26	0.22
Cropland	462.86	31.61
Deforested Area	7.73	0.53
Fallow land	9.46	0.65
Forest Scrub	0.31	0.02
Plantations	83.14	5.68
Play Ground	2.18	0.15
Ponds	0.76	0.05
Private Vacant	0.41	0.03
Rocky	0.05	0.00
School	0.95	0.07
Scrubland	115.37	7.88
Stream	9.88	0.67
Traffic and Transportation	15.26	1.04
Tree Clad Area	742.85	50.73
Village / Abadi Area	9.84	0.67
<b>Grand Total</b>	<b>1464.37</b>	<b>100</b>

### 3.3.44 PLANNING DISTRICT NO.44 - LUMDIENGSAI

**Area:** 1541.20 Hectares

**Location:** Peripheral Area

**Major Landmarks:** View point, New Shillong Township, Lumdiengsai (Figure 3-49).

**General Description about the planning district:** A significant portion of tree-clad area at 53.05%, followed by scrubland at 20.75%, cropland at 12.93%, and fallow land at 3.72%. Other land use types include bamboo, deforested area, plantations, and quarry (Table 3-47).

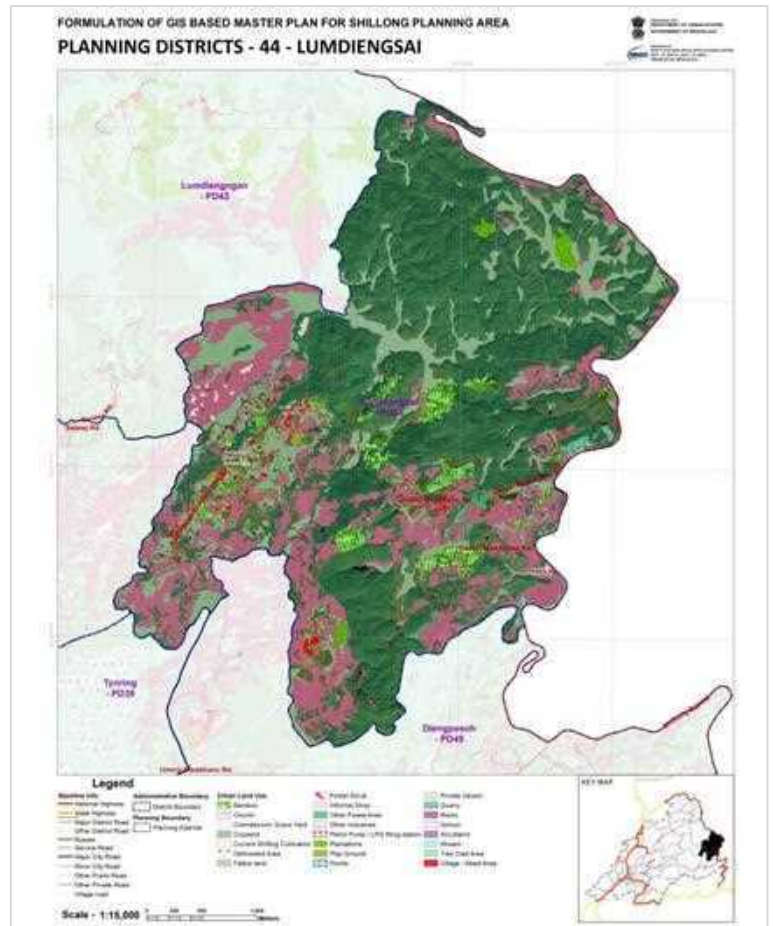


Table 3-47: Existing ULU - PD44 - Lumdiengsai

Figure 3-49: Planning District – 44 - Lumdiengsai

Lumdiengsai - Categories	Area(Ha)	%age
Bamboo	60.68	3.94
Church	0.50	0.03
Crematorium/ Grave Yard	0.05	0.00
Cropland	199.20	12.93
Current Shifting Cultivation	2.83	0.18
Deforested Area	18.77	1.22
Fallow land	57.36	3.72
Forest Scrub	0.16	0.01
Informal Shop	0.05	0.00
Other Forest Area	4.50	0.29
Other Industries	0.39	0.03
Petrol Pump / LPG Filling	0.59	0.04

Lumdiengsai - Categories	Area(Ha)	%age
Plantations	9.27	0.60
Play Ground	1.63	0.11
Ponds	0.26	0.02
Private Vacant	1.12	0.07
Quarry	7.48	0.49
Rocky	0.05	0.00
School	0.60	0.04
Scrubland	319.86	20.75
Stream	7.81	0.51
Traffic and Transportation	18.48	1.20
Tree Clad Area	817.61	53.05
Village / Abadi Area	11.97	0.78
<b>Grand Total</b>	<b>1541.20</b>	<b>100</b>

### 3.3.45 PLANNING DISTRICT NO.45 - NONGTYRKHANG

**Area:** 1661.53 Hectares

**Location:** Peripheral Area

**Major Landmarks:** Mawiong, Ummir, Nongbareh Lyntiar, Jhanzubi Point (Figure 3-50).

**General Description about the planning district:** The major land uses in Nongtyrkhang include cropland, scrubland, tree-clad areas, and village/abadi areas. Cropland accounts for 19.5% of the total land use, followed by scrubland at 21.7%, tree-clad areas at 35.15%, and village/abadi areas at 3.13%. Other significant land uses in the area include rocky areas, rivers, and shifting cultivation (Table 3-48).

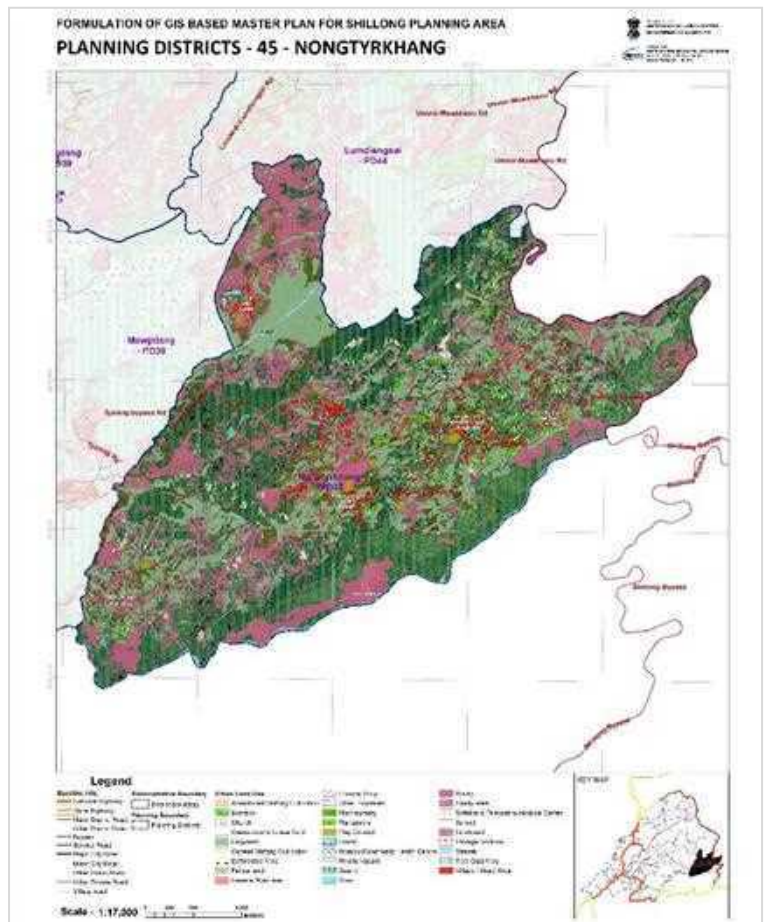


Table 3-48: Existing ULU - PD45 - Nongtyrkhang

Diengpasoh - Categories	Area(Ha)	%age
Abandoned Shifting Cultivation	1.77	0.11
Bamboo	71.97	4.33
Church	1.74	0.10
Crematorium/ Grave Yard	0.34	0.02
Cropland	323.94	19.50
Current Shifting Cultivation	10.37	0.62
Deforested Area	31.21	1.88
Fallow land	130.87	7.88
General Business	0.19	0.01
Informal Shop	0.94	0.06
Other Industries	0.38	0.02
Plant nursery	0.39	0.02
Plantations	4.93	0.30
Play Ground	6.14	0.37
Ponds	2.78	0.17

Figure 3-50: Planning District – 45 - Nongtyrkhang

Diengpasoh - Categories	Area(Ha)	%age
Primary/CHC	0.82	0.05
Private Vacant	0.12	0.01
Quarry	5.11	0.31
River	12.64	0.76
Rocky	6.67	0.40
Sandy area	0.23	0.01
Satellite & Telecom Center	0.05	0.00
School	0.97	0.06
Scrubland	360.55	21.70
Storage Godown	0.45	0.03
Stream	10.57	0.64
Traffic and Transportation	39.31	2.37
Tree Clad Area	584.07	35.15
Village / Abadi Area	52.01	3.13
<b>Grand Total</b>	<b>1661.53</b>	<b>100</b>

## 4 LAND SUITABILITY

### 4.1 LAND USE SUITABILITY ANALYSIS

Land suitability is the ability of a specific category of land to accommodate a particular purpose, and the land suitability classification process includes the assessment and grouping of different land areas in terms of their suitability for a given purpose (Blaschke, 2013). Analysis of land-use suitability is a very important challenge faced by city planners and administrators with the goal of determining the most suitable spatial pattern for potential land use in the future. It is required for planning the future use of the land use and regional planning. The land suitability depends on two types of factors – Current suitability and Potential suitability. The first one refers to the land suitability for a defined land use based on its present condition and no improvements in it. While the second factor, Potential suitability refers to the land suitability which depends on future dates and after specified improvements that have been completed wherever necessary. Land suitability defines sustainability of a land use with minimum vulnerability as shown in *Figure 4-1*(T.N, 2003). Land suitability is considered as one of the most effective techniques for urban growth and helps in identification of urban growth locations depending on different types of weight and criteria.

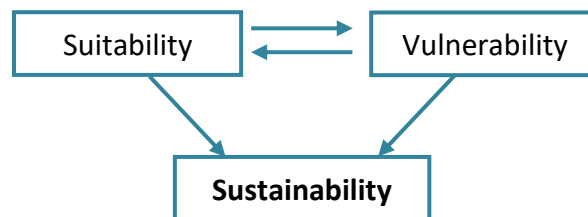


Figure 4-1: Land use Sustainability (T.N, 2003)

Land suitability can be used in different types of applications – prediction of land-use change in the future, research on ecosystems, landfill sites, green spaces, water bodies, waste water treatment facilities, coastal areas etc. (Maher Milad Aburas, 2015).

Land suitability classes are shown in following *Table 4-1*.

Table 4-1: Land Suitability Classes

Class	Suitability Classification	Definition
S1	Highly suitable	Land that has no substantial restrictions to continuous usage of a specified application.
S2	Suitable	Land that has only slight restrictions that do not affect efficiency or profits substantially, and will not increase inputs above an appropriate amount.

S3	Moderately suitable	Land with limitations that are moderately serious in aggregate for the continued implementation of a given use; the limitations would reduce profitability or benefits and increase the necessary inputs to the degree that the total profit to be obtained from the usage, while still desirable, is substantially lower than that anticipated on Class S1 property.
S4	Low & very low suitable	Land with limitations, which are extreme in aggregate for the continuous application of a given usage and will therefore reduce efficiency or benefits, or increase the necessary inputs, that this investment will be justified only marginally.

## 4.2 METHODOLOGY FOR LAND USE SUITABILITY ANALYSIS

The need for a land use suitability analysis is felt to appropriately and efficiently allocate land parcels to different uses, so when development/growth takes place, the city should know what goes where. To ascertain the anticipative nature of development plan, this exercise is required. The master plan would be vastly incomplete if not for reasonable land use distribution. The essential essence of the approach is to allocate land use to a particular land parcel based on the relative suitability, which is in turn analysed by various land-cover, demographic, economic criteria (Figure 4-2).

### 4.2.1 DEVISING CRITERIA

The use of GIS to support land use planning is an efficient application of GIS technology. A map-based product designed to reflect the desires of the community increases the likelihood that suggested zoning changes and land use policies shall be adopted. Realizing that citizen acceptance of proposed changes is required for effective implementation. GIS can be used to incorporate citizen input and to prioritize issues. All analysis for Shillong Planning area was a direct result of public participation in the form of Surveys (spatial and non-spatial) integrated into GIS maps. It was ensured that the criteria and priorities developed reflected the goals from the comprehensive planning process. To facilitate the process of setting criteria and designing new land-use policies, a collective opinion of representatives from every group was been obtained (Primary Socio Economic survey by NESAC, 2020). Although several natural resource categories emerged, the proceedings combine the criteria into certain main areas of concern used in the GIS suitability analysis. These areas were:

- Reserved Forest Area Protection.
- Resource Connectivity.
- Economic boost to the Industrial sector.
- Proximity to existing developed areas and compatibility with existing land uses;

- Potential impact of development on areas and sites designated by local historic commissions/Tourism boards as historic, culturally significant, or scenic;
- Land use and development requirements of local development regulations; and
- Availability of community facilities, including water (water quality), sewer, storm-water, and transportation.

The criteria for the analysis of each area of concern were developed during facilitated small group discussion as a part of socio economic survey conducted and *Table 4-2* shows the following criteria along with their weightages of importance were accepted. *Table 4-3* shows the scoring scheme thus obtained would be:

*Score for a Particular Grid*

$$= \sum_{i=0}^{i=n} \{(Weightage\ of\ i^{th}\ criterion) * (Score\ obtained\ with\ the\ help\ of\ i^{th}\ criterion)\}$$

(Source: Primary)

#### 4.2.2 LAND SUITABILITY FACTORS AND WEIGHTAGE CRITERIA

The Land Suitability Rating System (LSRS) is a rule-based set of algorithms that integrate soil, climate, physiographic and landscape factors to calculate a classed suitability rating for a given landscape to support designing and allocation of various land uses.

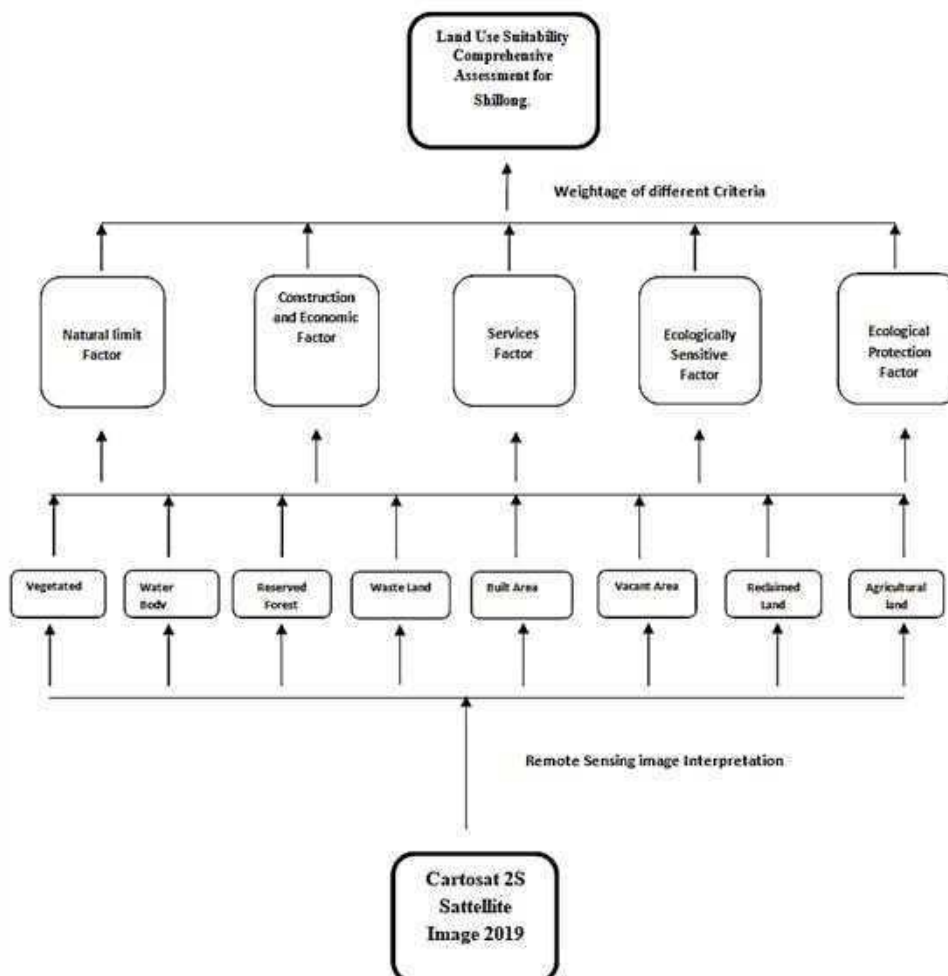


Table 4-2: Criteria and Weightage for Scoring Scheme

Factor Name	Criteria & Factor description	Residential	Industrial	Commercial	Logistics Hub	IT Park	Animal Husbandry	Diary
		<b>Weightages</b>						
Construction and economic factor	Distance from CBD (in Km)	7.2	3.5	9	0	6	7.5	8
	Building Density (sq. Km)	9.1	4.6	8.4	-4	-6	3.5	3.5
	Road Density (sq. Km)	5.1	6.7	7	4.2	0	0	0
	Freight Corridor (Km)	0	9.2	0	9.8	0	0	0
	Road Buffer (m)	8.3	7.9	7.8	6.2	8	7.8	7.5
	Distance From Airport (Km)	0	0	0	0	9	0	0
Natural Limited Factor	Slope in Degrees	7.2	8.2	6.8	9.1	6.8	0	0
	Elevation (m)	0	8.2	6.4	7.1	0	0	0
Services Factor	Water Supply	9.2	7.8	8	0	7.5	7.2	7.2
	Public Utilities (Based on the no of public utilities falls under each Zones)	8.2	4.2	0	0	6	0	0
	Solid Waste Management	8.8	0	7.2	0	0	0	0
Ecological protection factor	Ecology (Based on the no of ecological features in each Zone)	0	7.3	0	0	7.7	0	0
	Distance From Cropland (m)	0	0	0	0	0	9.5	9.5
Ecologically sensitive factor	Distance From Dumping yard (m)	0	0	0	0	0	0	8.5
	River Buffer (m)	8.8	7.7	8.3	6.2	0	0	0



Table 4-3: Scoring Hierarchy for Multi Criteria Decision

CRITERIA & FACTOR DESCRIPTION	INDEX/RANGE	SCORE
<b>Distance from CBD (in Km)</b>	0-0.5	5
	0.5-1	5
	1-3	4
	3-5	4
	5-10	3
	10-15	2
	>15	1
<b>Building Density (Buildings per sq. Km)</b>	0 - 100	5
	100-300	5
	300-500	4
	500-800	4
	800-1000	3
	1000-1500	3
	1500-2500	2
	2500-4500	1
<b>Water Supply (Duration of service)</b>	Irregular	1
	More than 2 hours	2
	2 Hours	3
	1-2 Hours Or 1 Hour	4
	Less than 1 hour Or Bore Well	5
<b>Solid Waste Management (Disposal method)</b>	Door to door collection	5
	Individually to the Nearest Bin	3
	Community level collection	2
	Dumped at one's Own Land	1
<b>Slope (in Degrees)</b>	0 - 10	5
	10.1 - 20	4
	20.1 - 30	3
	30.1 - 40	2
	40.1 - 81.6	1
<b>Elevation (Extent in meters)</b>	<1000	5
	1001-1100	4
	1101-1200	3
	1201-1400	2
	1401 and above	1
<b>Distance from Freight Corridor (Km)</b>	0-1	5
	1-2	4
	2-5	3
	5-8	2
<b>Proximity to Roads (in meters)</b>	0-100	5
	100-500	4
	500-1000	3

	1000-1500	2
	1500-2000	2
	>2000	1
<b>Road Density (sq. Km)</b>	0 - 3.5	1
	3.5-6.5	2
	6.5-10.5	3
	10.5-17.5	4
	17.5-24.5	5
<b>Public Utilities (Based on the no of public utilities falling under each Zones)</b>	0 - 5	1
	5.1 - 10	2
	10.1- 30	3
	30.1 - 60	4
	60.1- 146	5
<b>River Buffer (in meters)</b>	0-100	5
	100-500	4
	500-1000	3
	1000-2000	2
	>2000	1
<b>Ecology (Based on the no of ecological features in each Zones)</b>	0-3	5
	3-8	4
	8-13	3
	13-20	2
	20-35	1
<b>Distance From Airport (in Km)</b>	0-2.5	5
	2.5-5	5
	5-7.5	4
	7.5-10	3
	10 - 15	2
	>15	1
<b>Distance From Cropland (in meters)</b>	0 -100	5
	100-200	4
	200-300	3
	300-500	2
	>500	1
<b>Distance From Dumping yard (in meters)</b>	0-500	1
	500-1000	2
	1000-1500	3
	1500-2000	4
	>2000	5

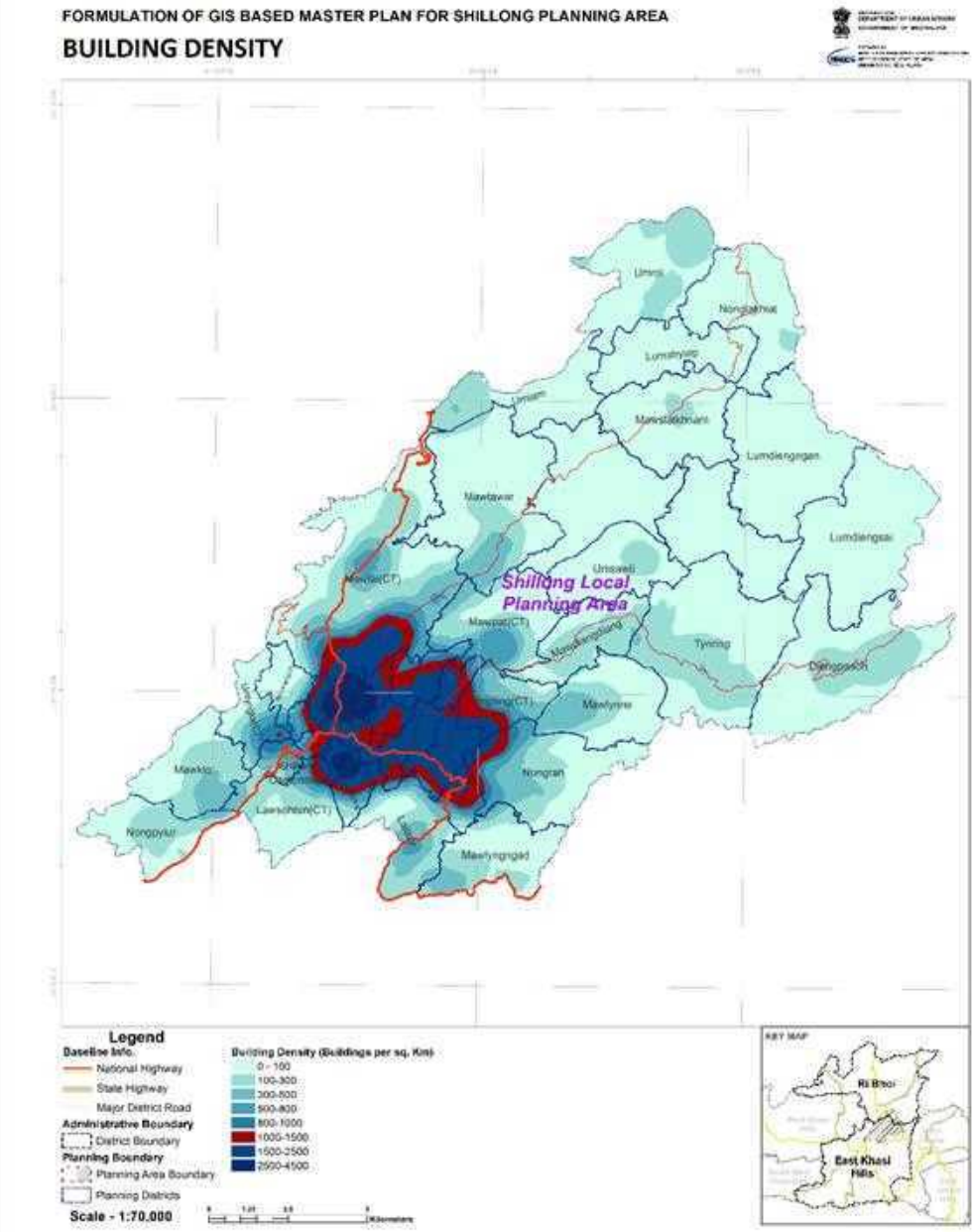


Figure 4-4: Building Density

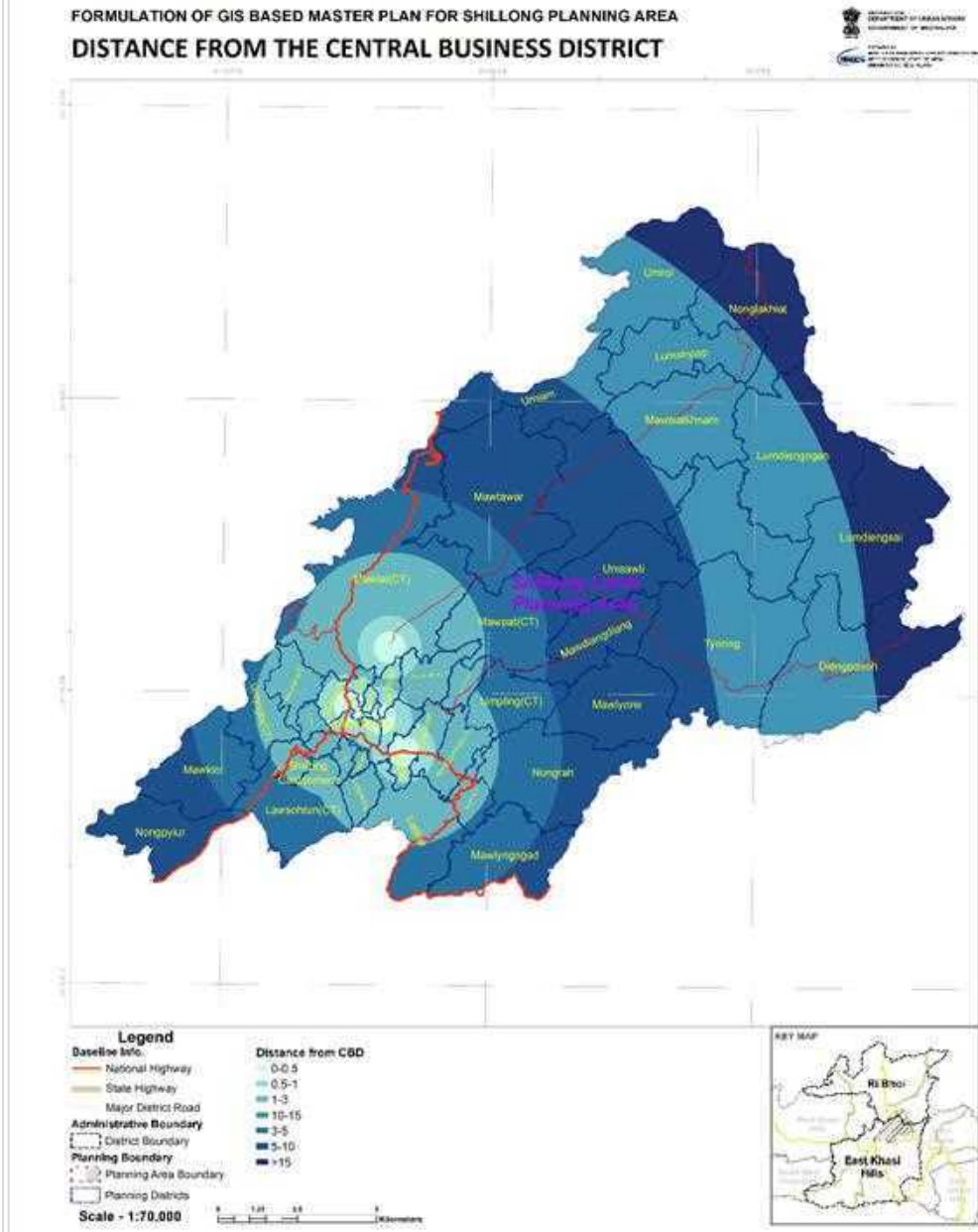


Figure 4-3: Distance from CBD



GIS Based Master Plan Under Atal Mission For Rejuvenation and Urban Transformation (AMRUT),  
Shillong Planning Area, Meghalaya

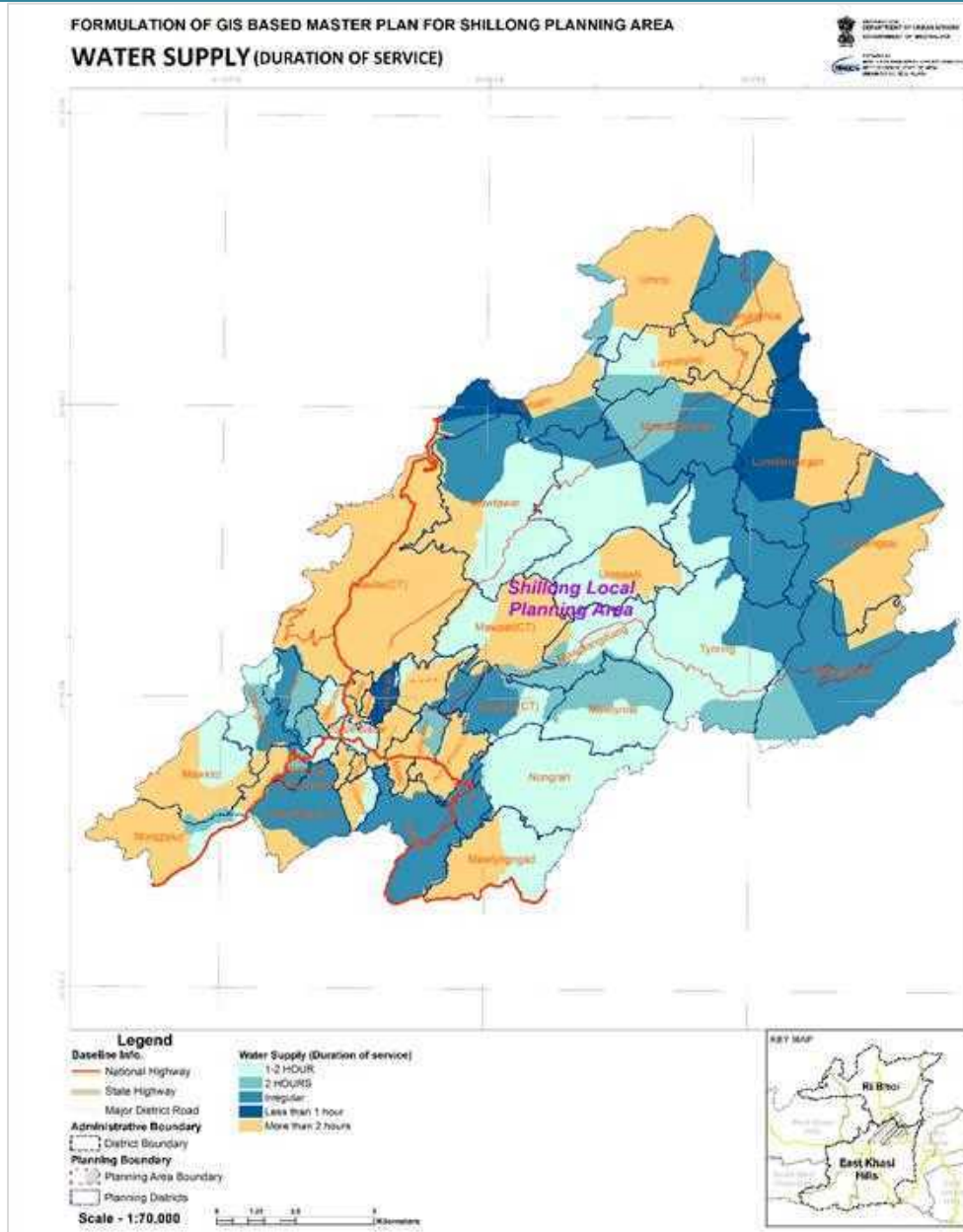


Figure 4-6: Water Supply

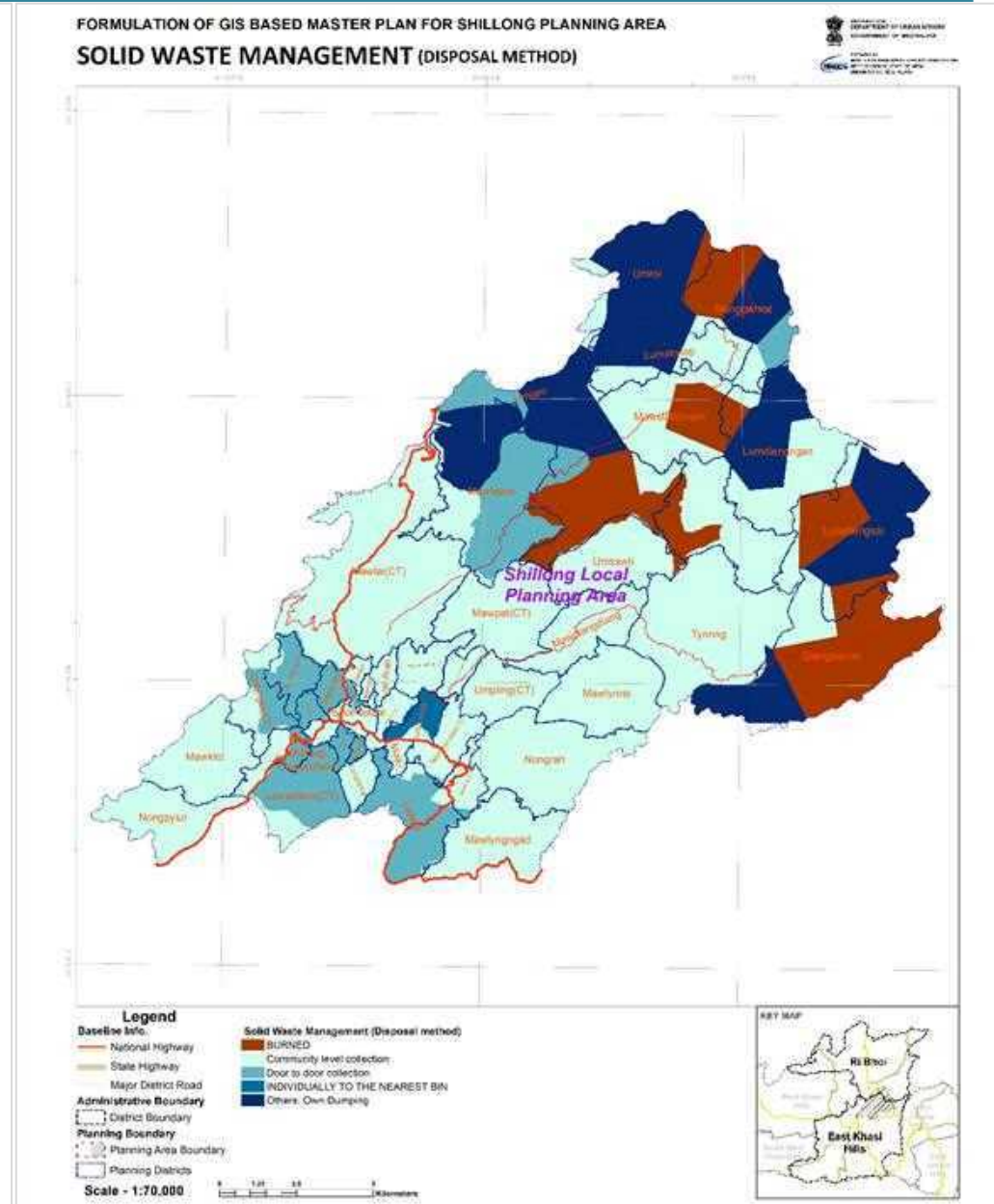


Figure 4-5: Solid Waste Management

GIS Based Master Plan Under Atal Mission For Rejuvenation and Urban Transformation (AMRUT),  
Shillong Planning Area, Meghalaya

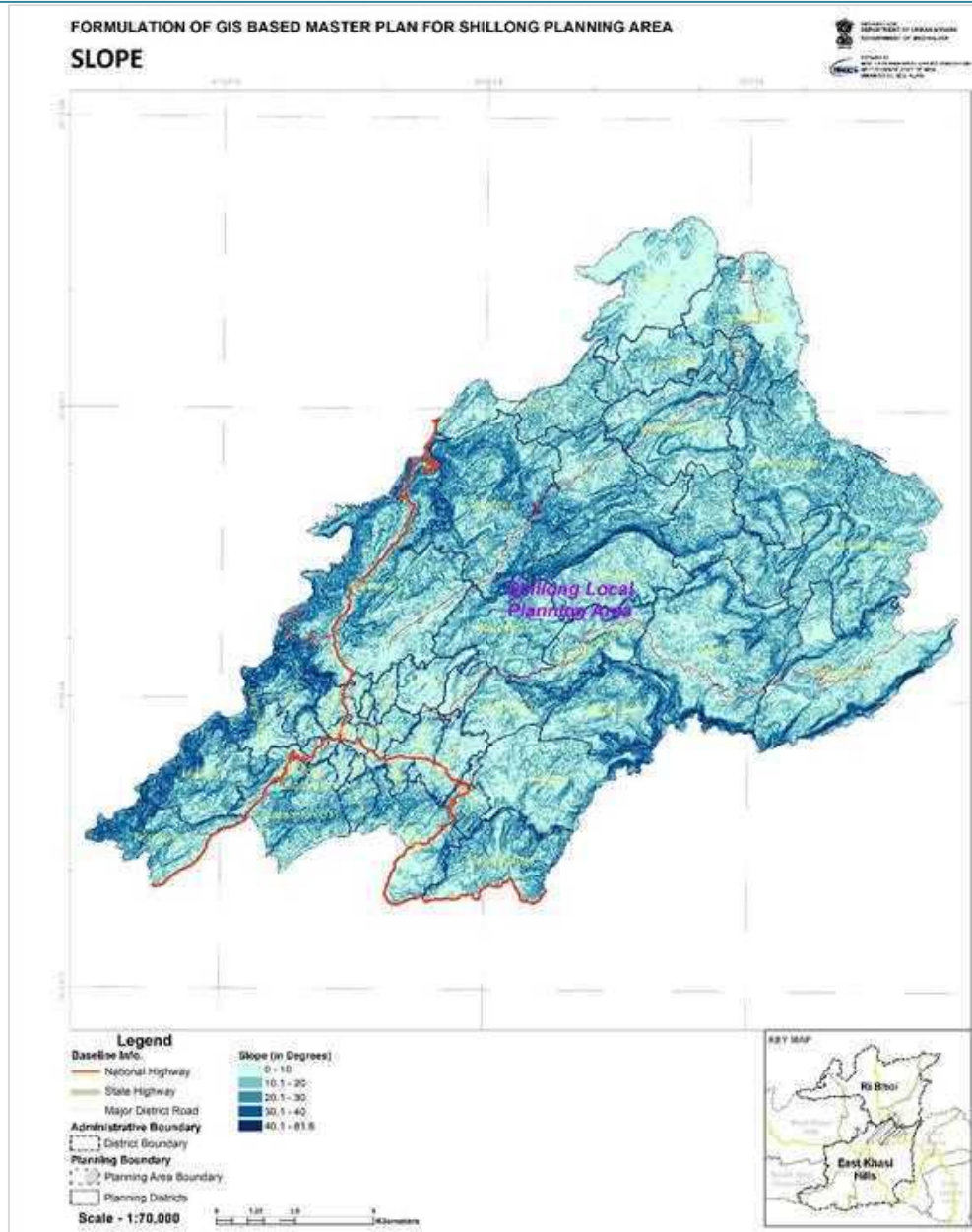


Figure 4-8: Slope

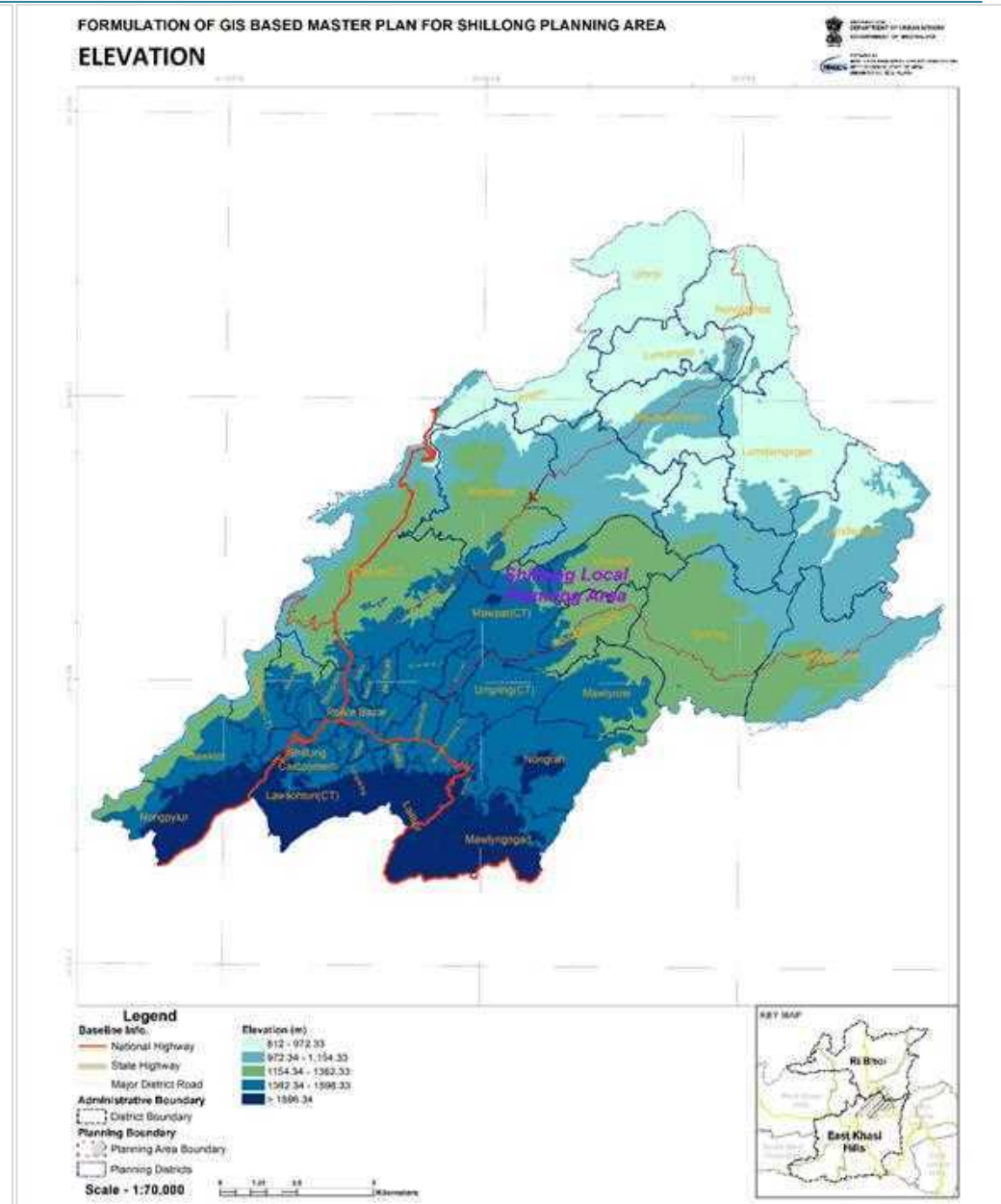


Figure 4-7: Elevation

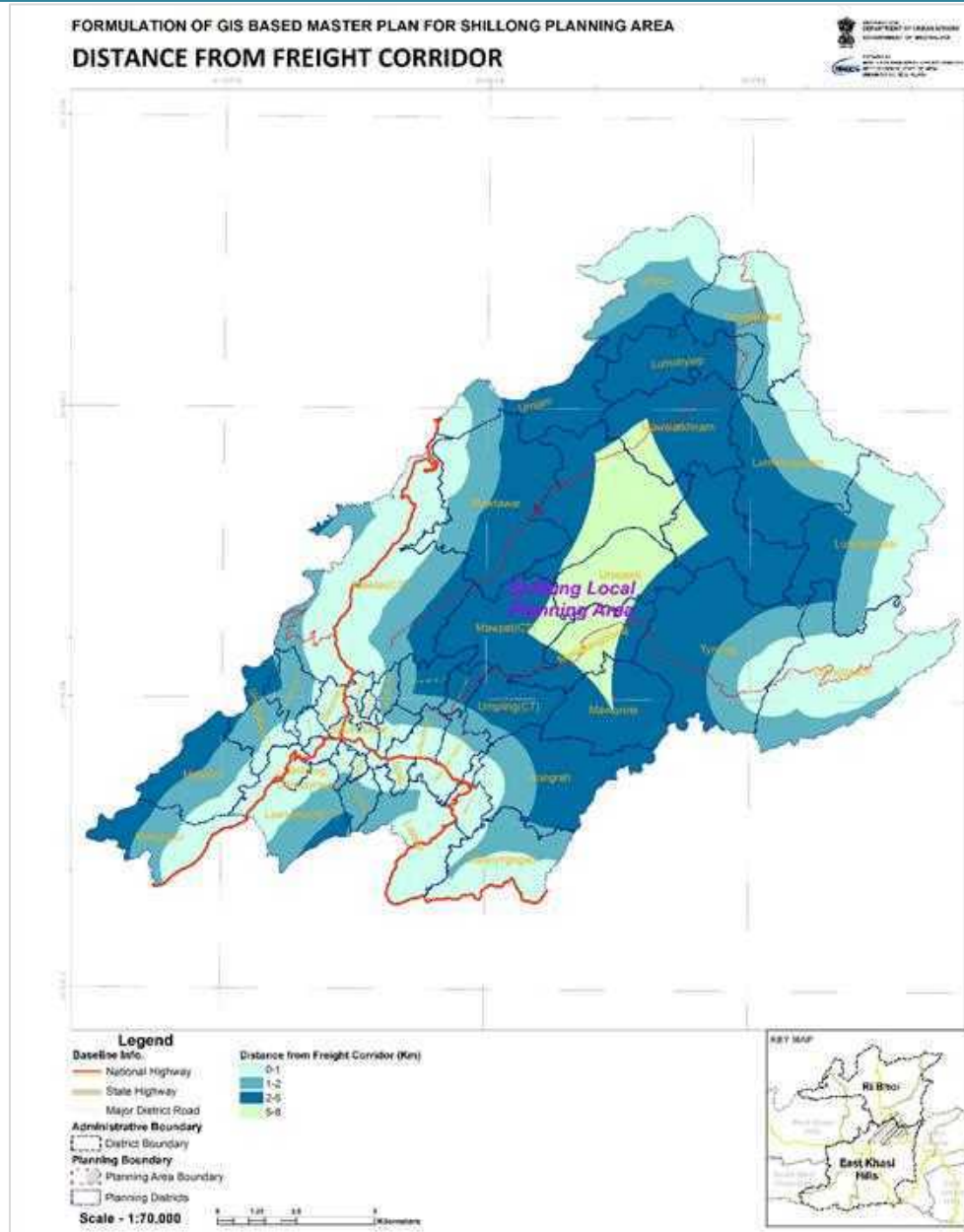


Figure 4-10: Distance from Fright Corridor

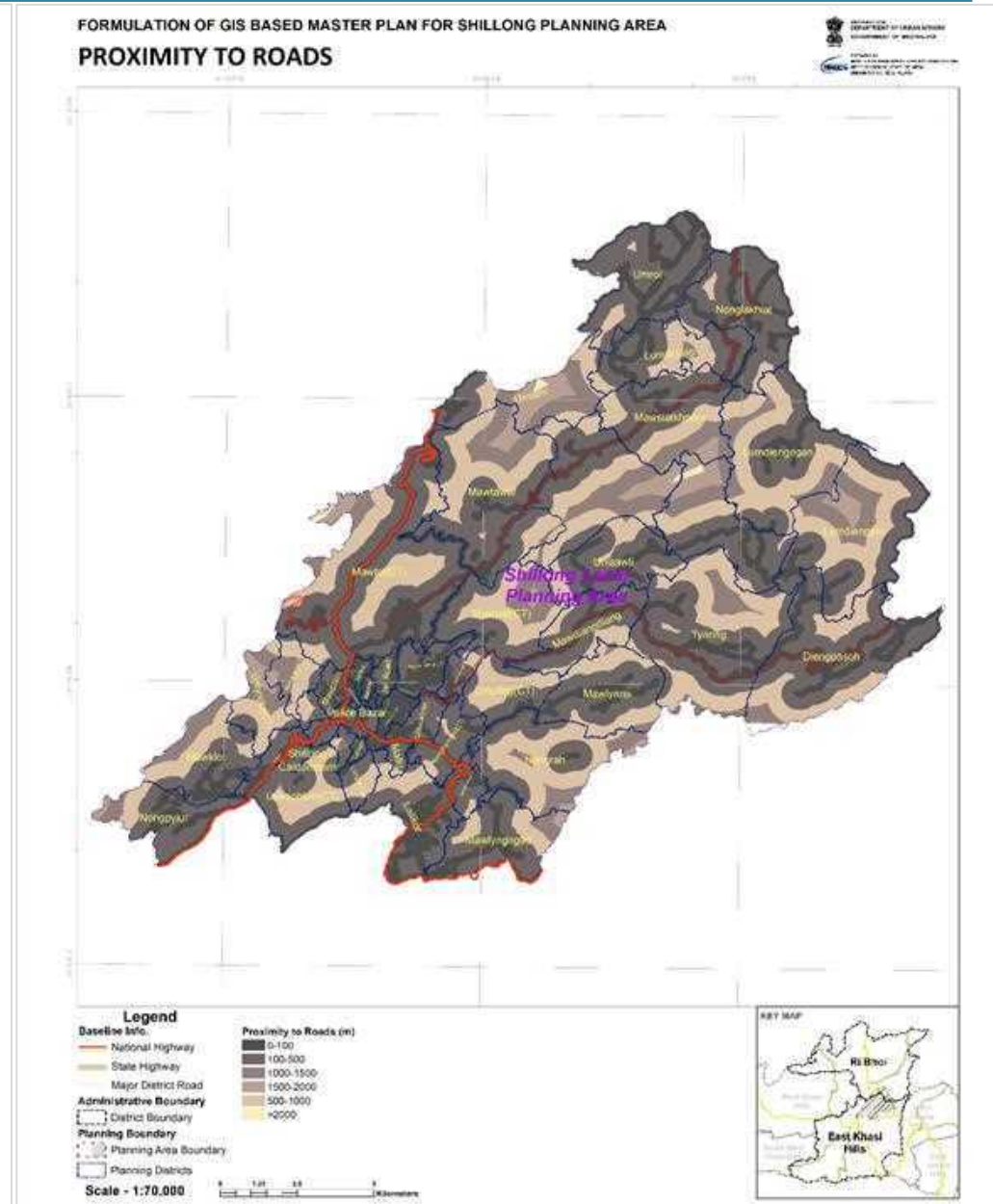


Figure 4-9: Proximity to Roads

GIS Based Master Plan Under Atal Mission For Rejuvenation and Urban Transformation (AMRUT),  
Shillong Planning Area, Meghalaya

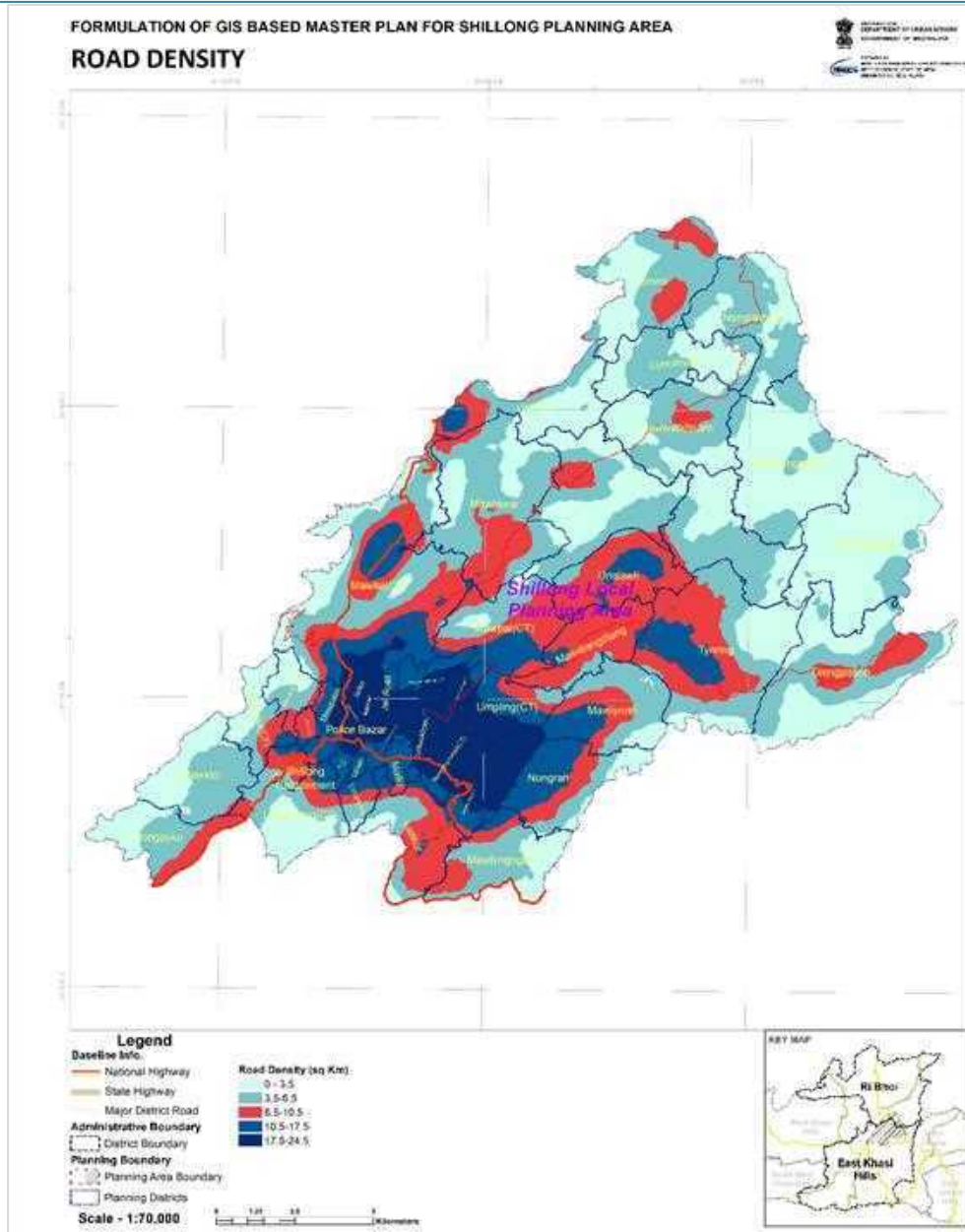


Figure 4-12: Road Density

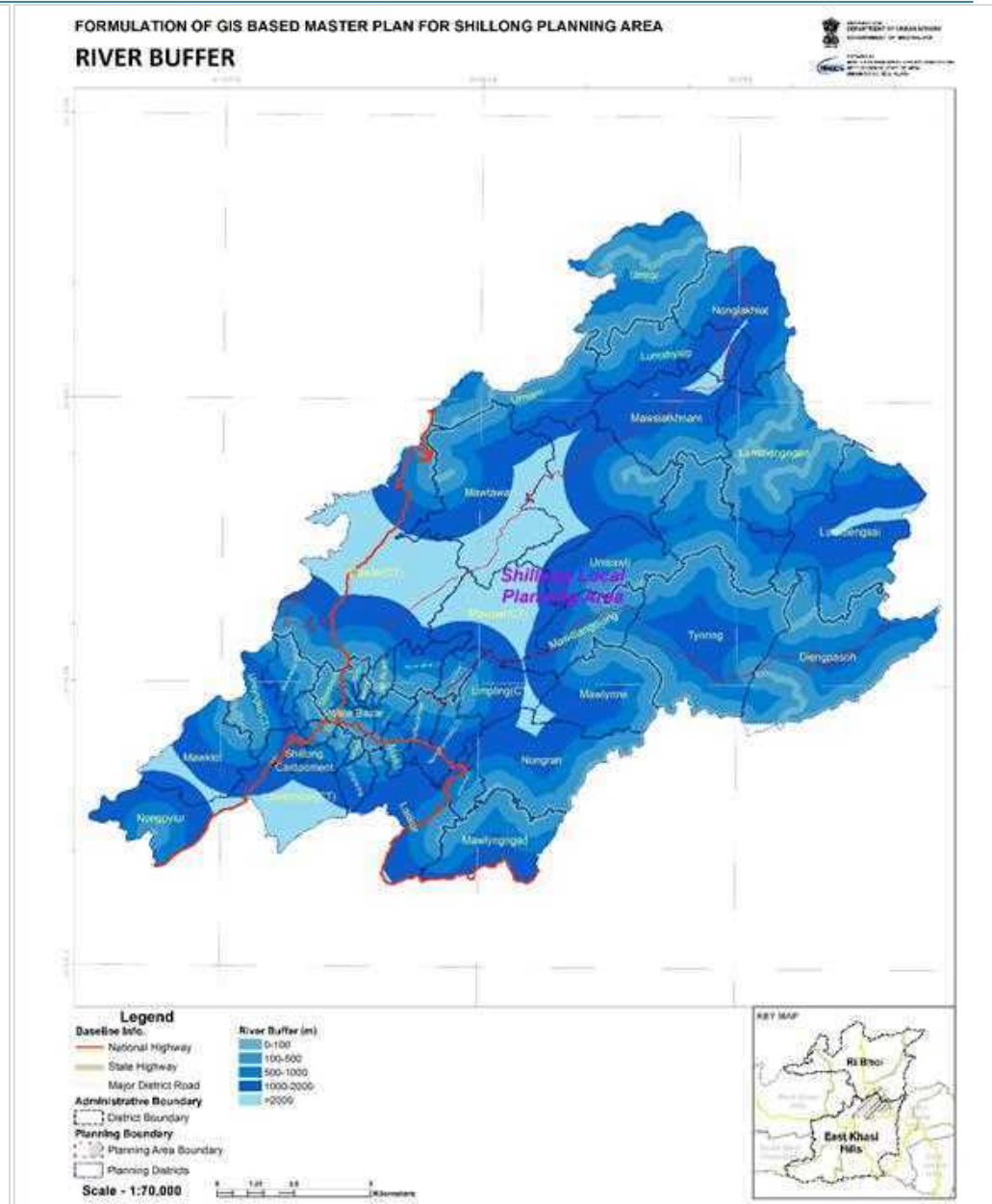


Figure 4-11: River Buffer

GIS Based Master Plan Under Atal Mission For Rejuvenation and Urban Transformation (AMRUT),  
Shillong Planning Area, Meghalaya

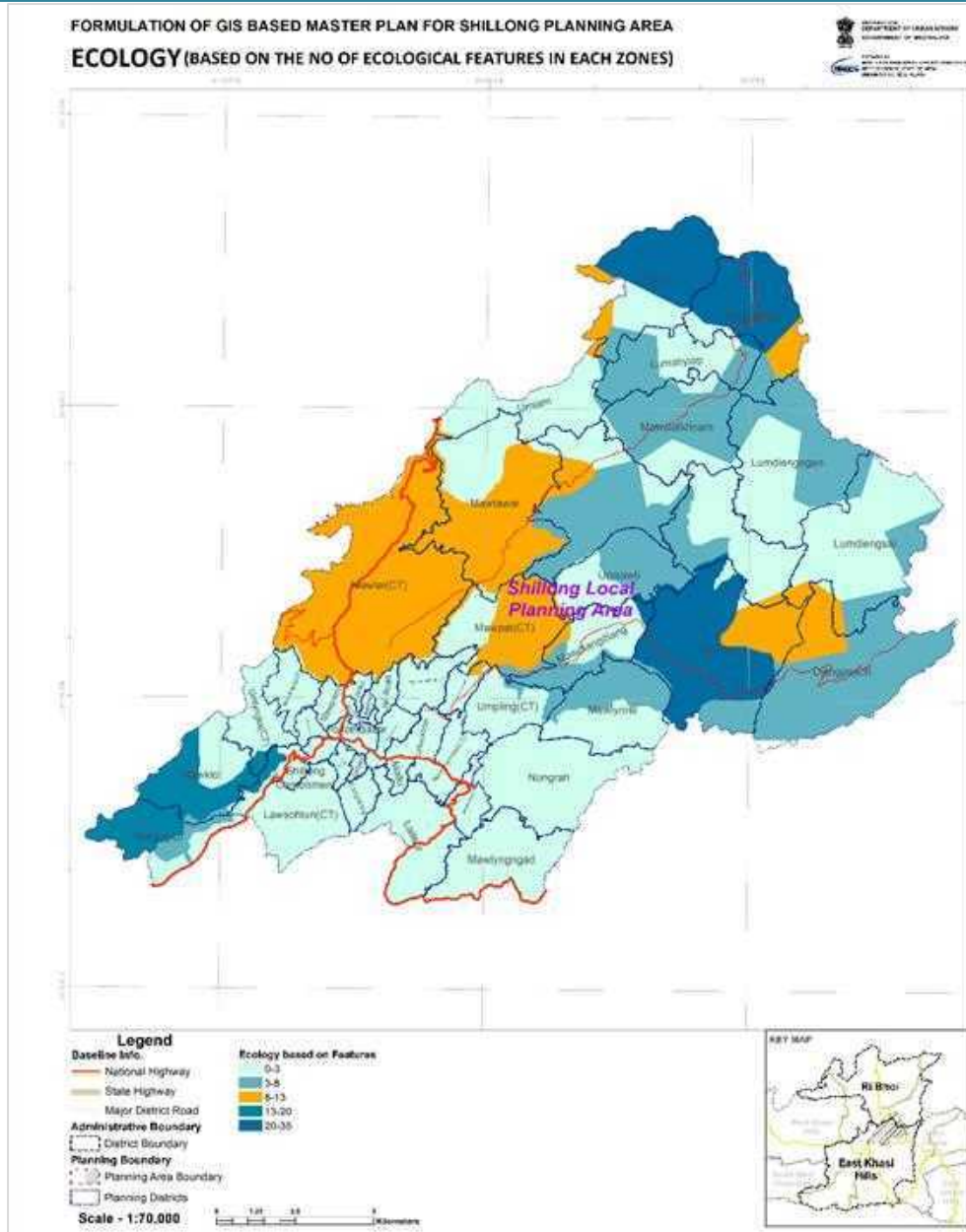


Figure 4-14: Ecology

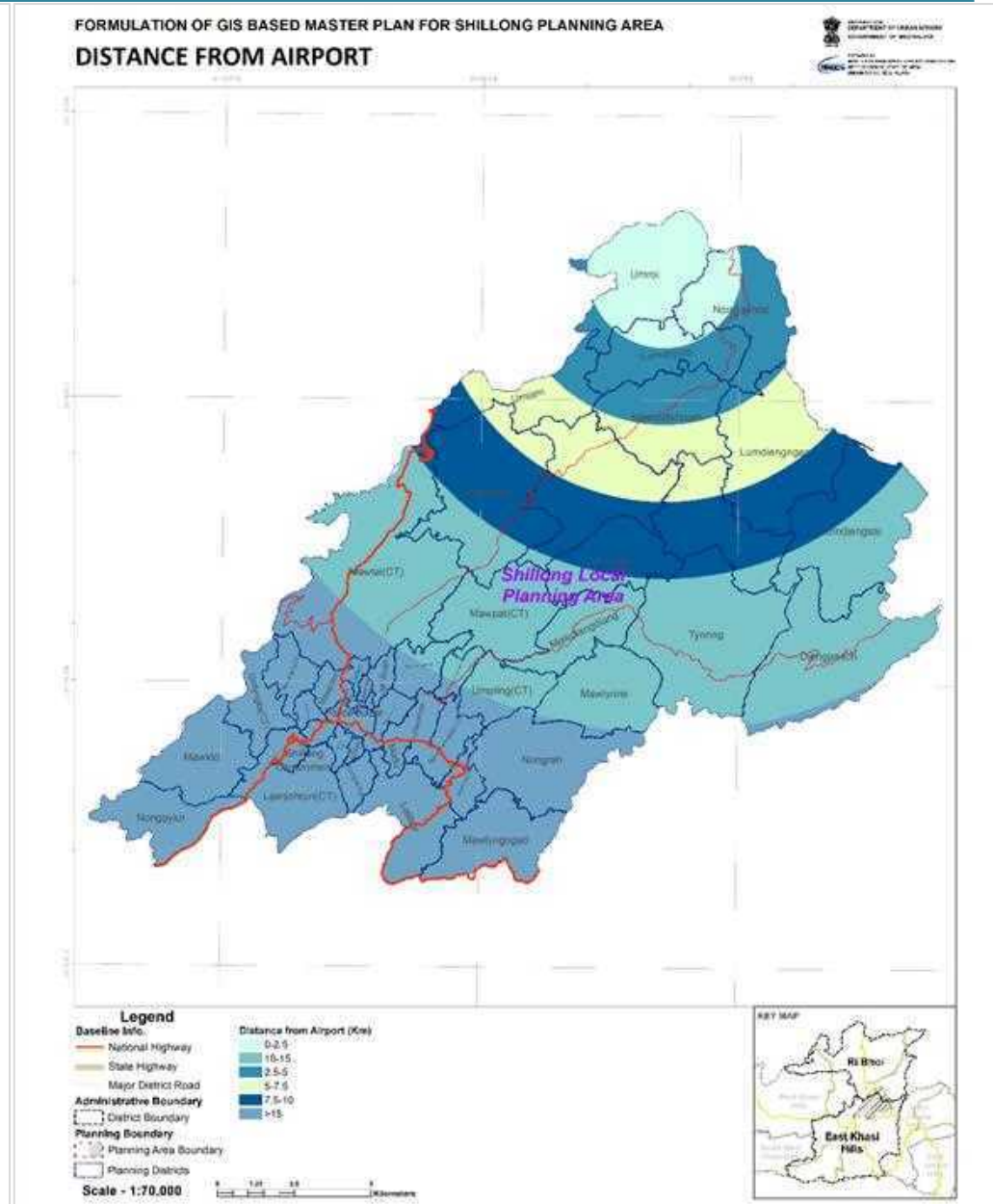


Figure 4-13: Distance from Airport



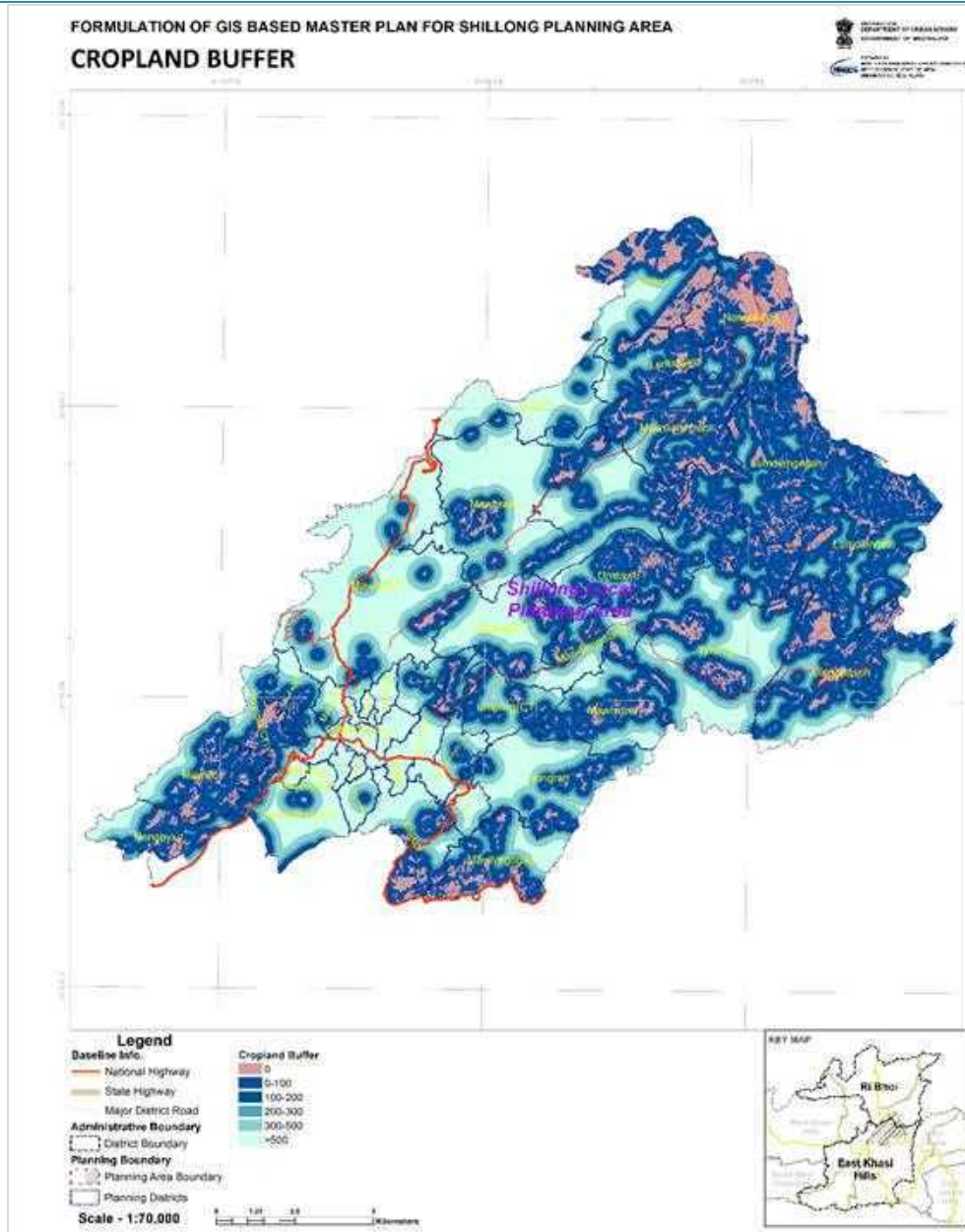


Figure 4-16: Cropland Buffer

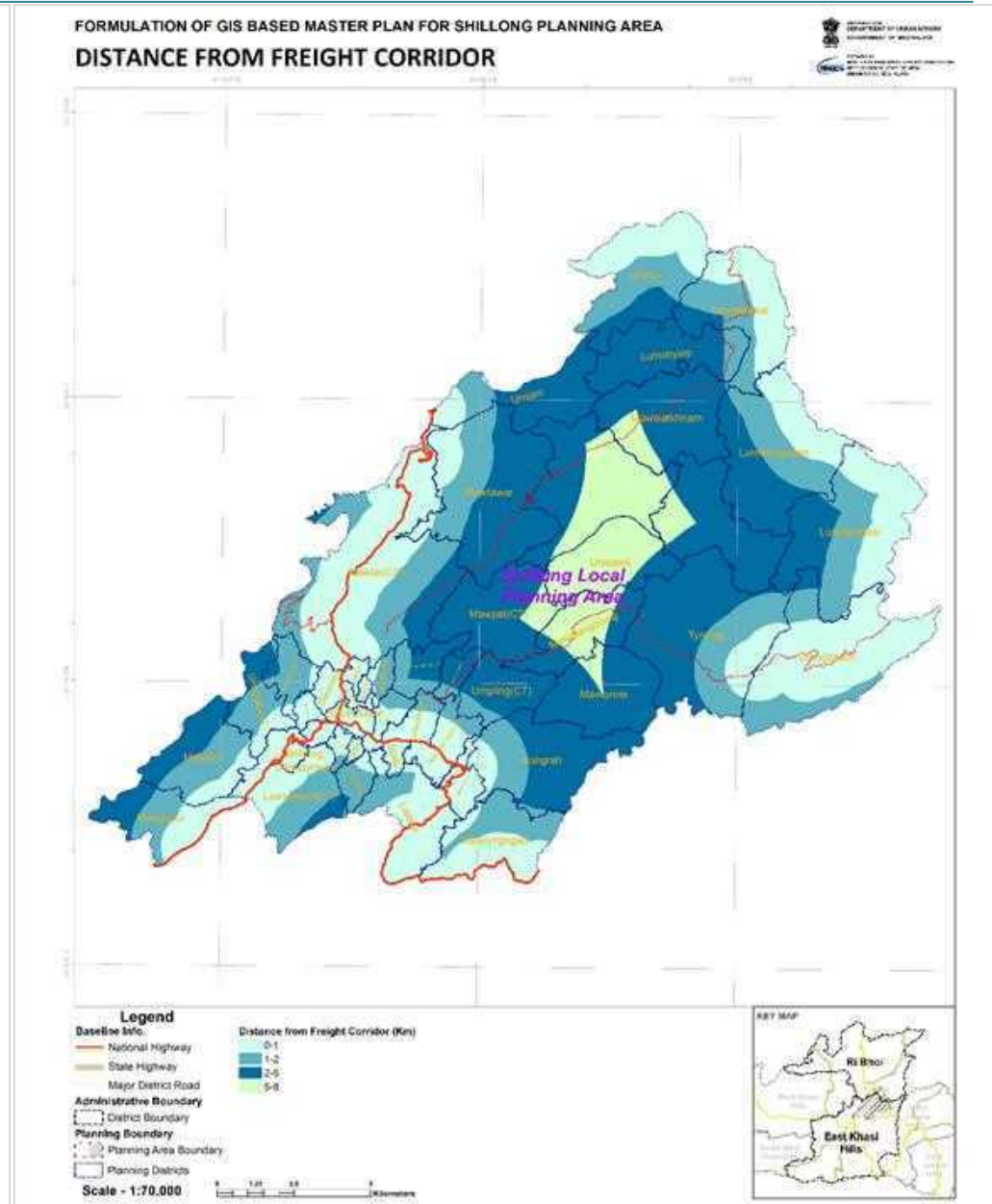


Figure 4-15: Distance from Dumping yard

### 4.3 LAND USE SUITABILITY RESULTS & OUTPUTS

Raster Maps are generated when the scores for each land parcel are eventually evaluated from the method so far described to quantitate. Each map suggests the highly suitable, moderately suitable and least suitable land parcel for particular Land-Uses. After generation of suitability maps (As shown in following maps), the maps are overlaid to obtain mutually exclusive high suitability land parcels. These mutually exclusive land parcels are allocated for that particular Land-Use. The land patches with overlap of similar suitability in two or more land-uses is then judged based on adjacent existing land use and the Land-Use with greater requirement is assigned. The land parcels where none of the Land-Uses are found to be suitable are kept for restraint and development is restricted in such places (until the score changes, the patches are to be reconsidered in next development term and scores re-evaluated). *Table 4-4* shows the MS-Excel facilitated the use of logic-based commands, which sorted the grids as out algorithm demanded.

Table 4-4: MS-Excel Criteria for Assigning Land use

<b>Residential Suitability</b>	
"Result" >=139.6 AND "Result" <= 183.1	Very Low Suitability
"Result" > 183.1 AND "Result" <= 203.2	Low Suitability
"Result" > 203.2 AND "Result" <= 223.9	Medium Suitability
"Result" > 223.9 AND "Result" <= 248. 7	High Suitability
"Result" > 248. 7AND "Result" <= 310.4	Very High Suitability

<b>Commercial Suitability</b>	
"Result" >= 146.4 AND "Result" <= 191.3	Very Low Suitability
"Result" > 191.3 AND "Result" <= 207.5	Low Suitability
"Result" > 207.5 AND "Result" <= 223.1	Medium Suitability
"Result" > 223.1 AND "Result" <= 243.5	High Suitability
"Result" > 243.5 AND "Result" <= 299.3	Very High Suitability

<b>Industrial Suitability</b>	
"Result" >= 151.3 AND "Result" <= 203.8	Very Low Suitability
"Result" > 203.8 AND "Result" <= 224.1	Low Suitability
"Result" > 224.1 AND "Result" <= 244.4	Medium Suitability
"Result" > 244.4 AND "Result" <= 266.9	High Suitability
"Result" > 266.9 AND "Result" <= 318.5	Very High Suitability

<b>Logistics Hub Suitability</b>	
"Result" >= 66.2 AND "Result" <= 113.3	Very Low Suitability
"Result" >113.3 AND "Result" <= 132.3	Low Suitability
"Result" > 132.3 AND "Result" <= 149.5	Medium Suitability
"Result" > 149.5 AND "Result" <= 167.3	High Suitability
"Result" > 167.3 AND "Result" <= 212.8	Very High Suitability

<b>IT Park Suitability</b>	
"Result" >= 35.8 AND "Result" <= 69.8	Very Low Suitability
"Result" > 69.8 AND "Result" <= 86.6	Low Suitability
"Result" > 86.6 AND "Result" <= 102.6	Medium Suitability
"Result" > 102.6 AND "Result" <= 118.4	High Suitability
"Result" > 118.4 AND "Result" <= 157	Very High Suitability

<b>Animal Husbandry</b>	
"Result" >= 66 AND "Result" <= 92	Very Low Suitability
"Result" > 92 AND "Result" <= 109	Low Suitability
"Result" > 109 AND "Result" <= 123	Medium Suitability
"Result" > 123 AND "Result" <= 138.5	High Suitability
"Result" > 138.5 AND "Result" <= 166.5	Very High Suitability

<b>Dairy Farming</b>	
"Result" >= 75.5 AND "Result" <= 101	Very Low Suitability
"Result" > 101 AND "Result" <= 127.5	Low Suitability
"Result" > 127.5 AND "Result" <=153.5	Medium Suitability
"Result" > 153.5 AND "Result" <=179.5	High Suitability
"Result" >179.5 AND "Result" <=206	Very High Suitability

### Development Permission

- If Industrial, Commercial or Residential suitability is high then Development permission is Extensive. This indicates that those parcels of land can be earmarked for the intended Land use and suitability index on a priority
- If Industrial, Commercial and Residential Suitability is low then Development permission is Restricted. This directs towards omission of those parcels of land for the intended Land use and suitability index and have lesser priority with respect to their land parcels
- Apart from any of these cases, the Development permission is Intensive and shall be used if further requirement of Land arises based on demand gap assessment.

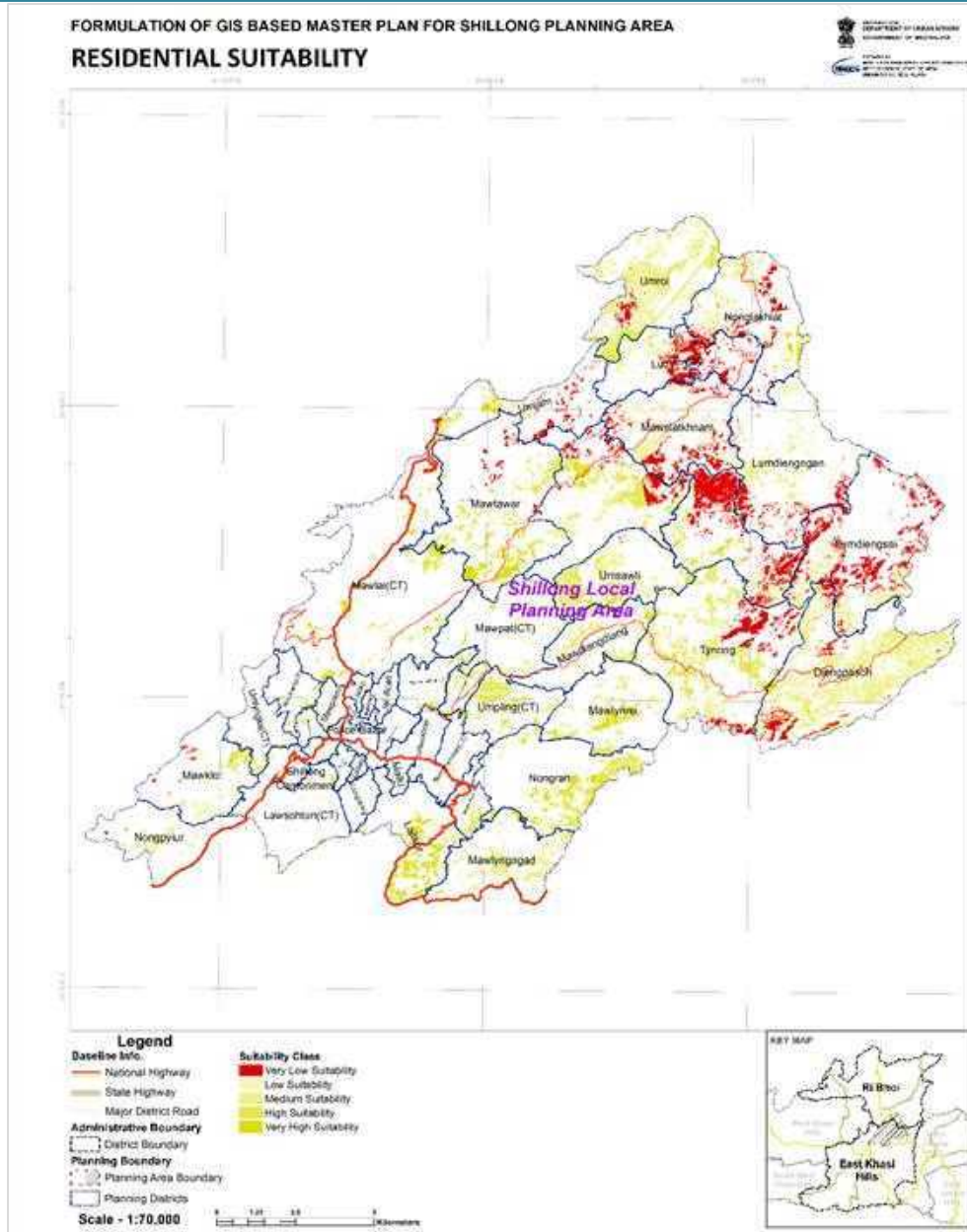


Figure 4-18: Residential Suitability

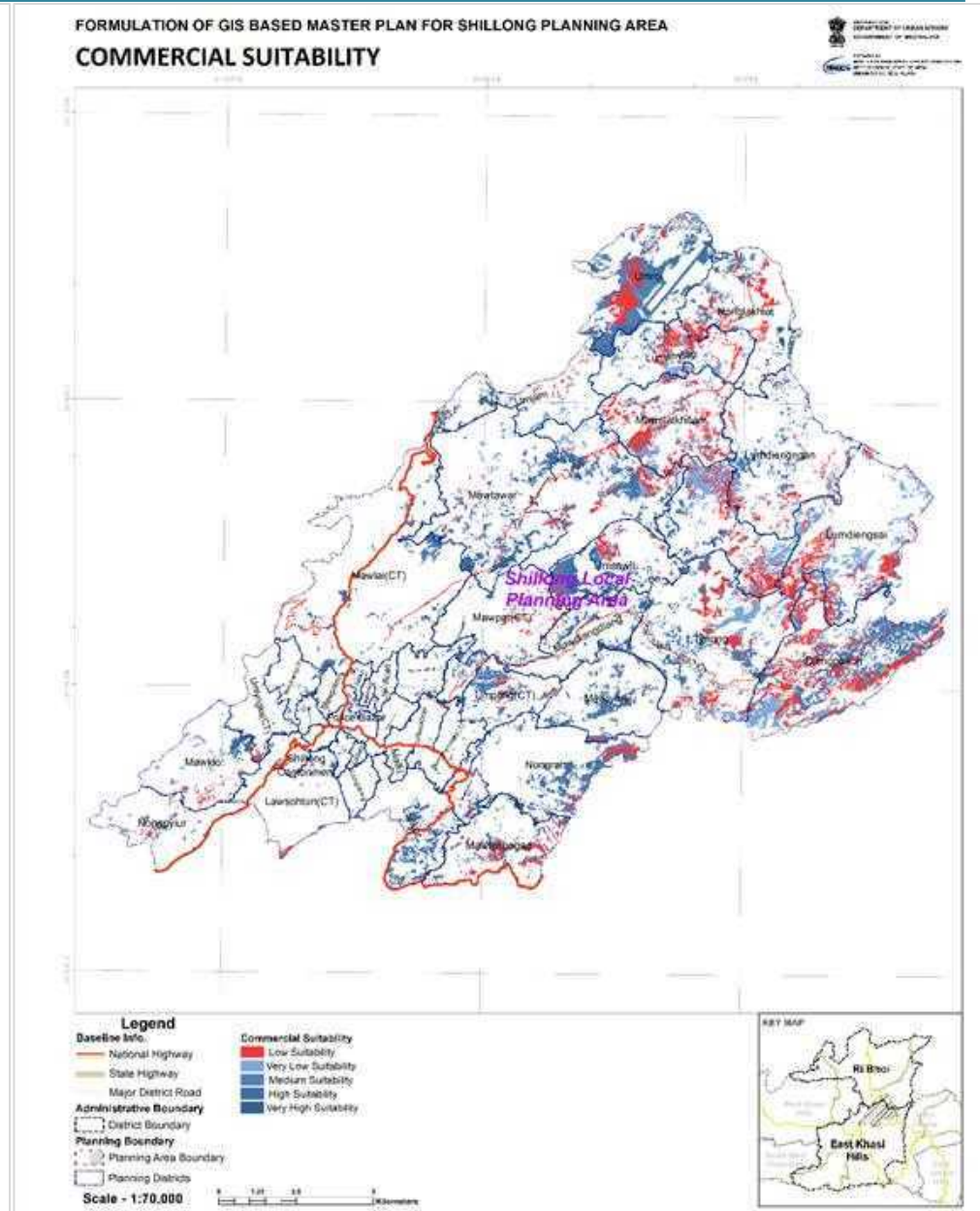


Figure 4-17: Commercial Suitability

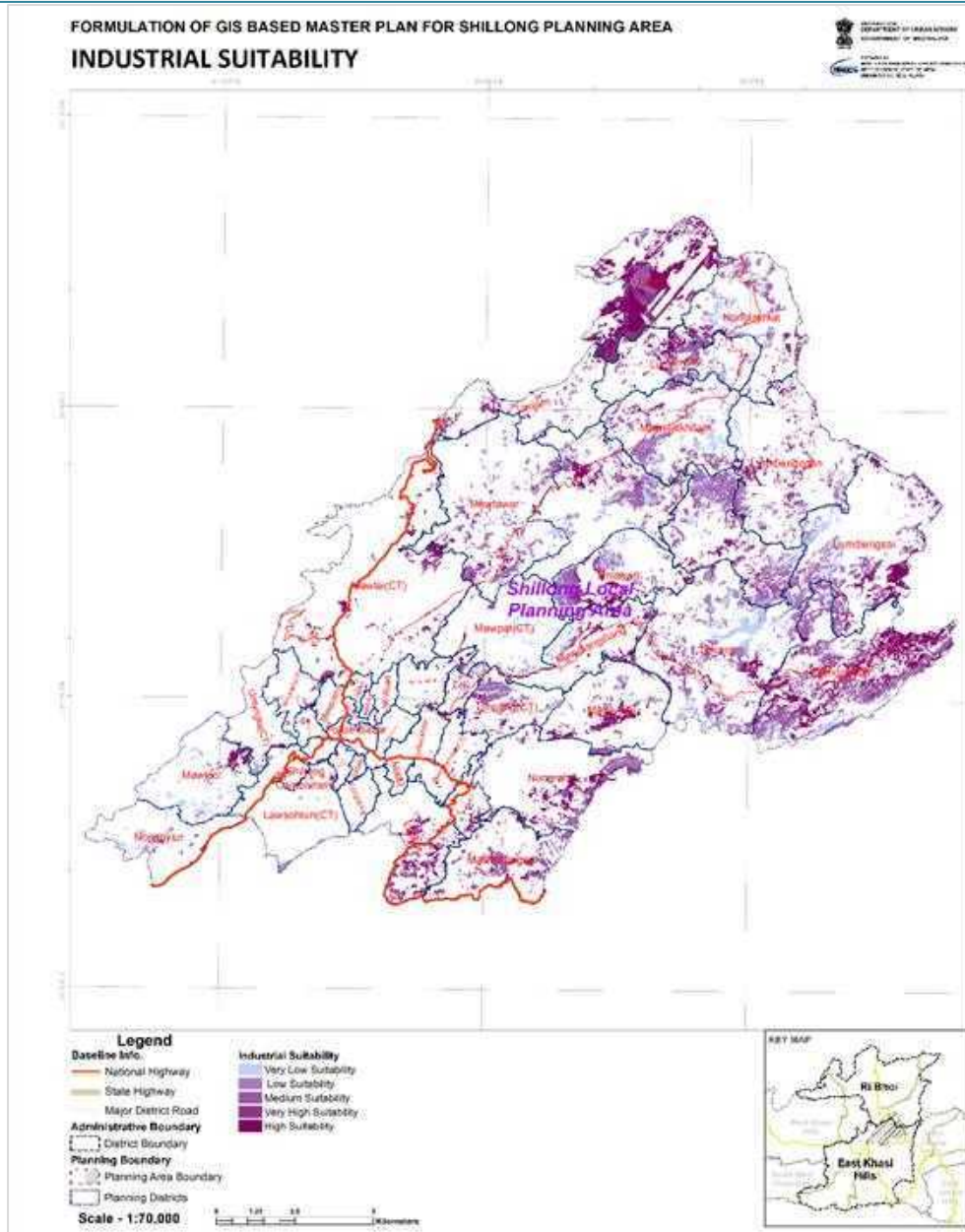


Figure 4-20: Industrial Suitability

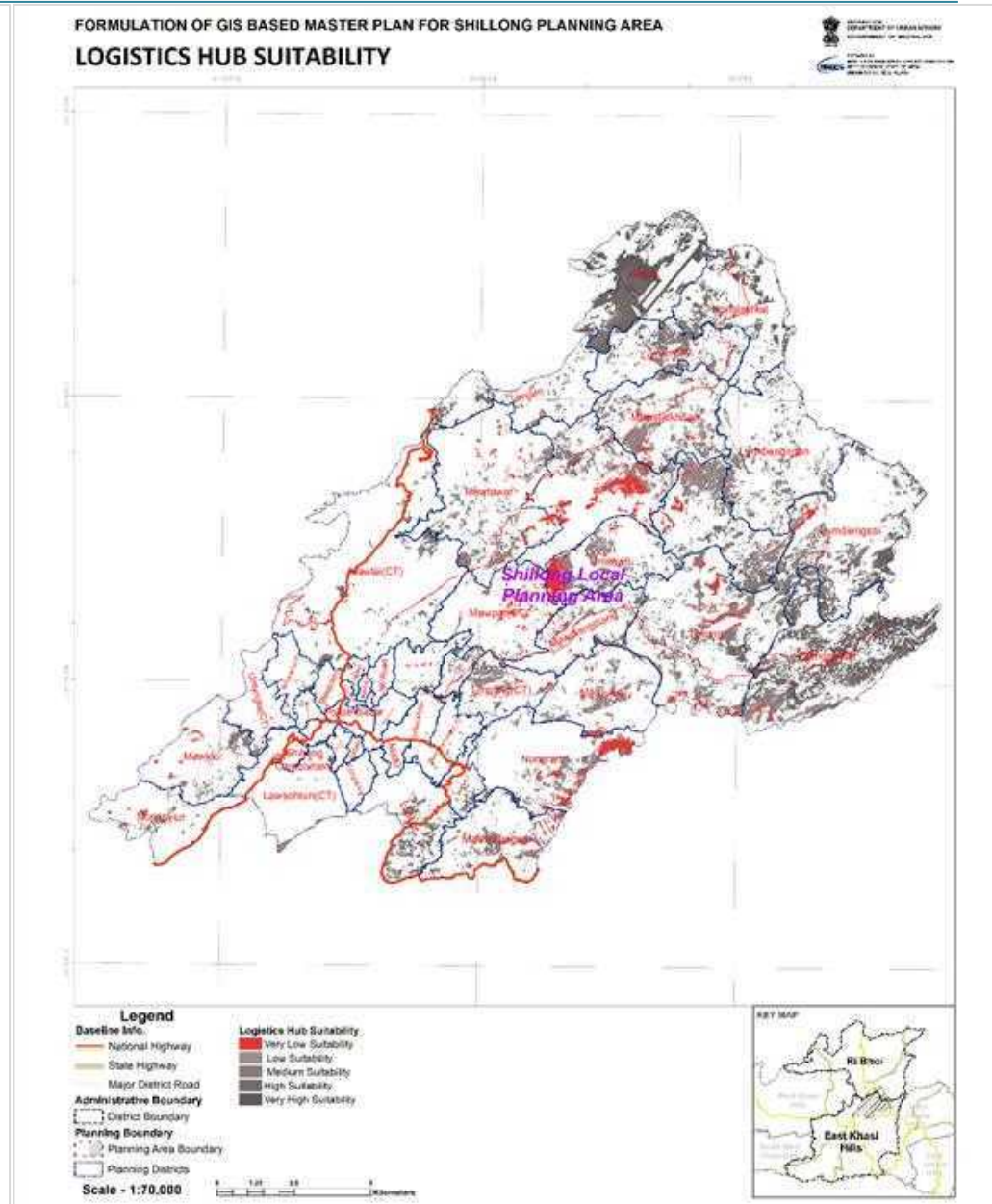


Figure 4-19: Logistics Hub Suitability

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Shillong Planning Area, Meghalaya

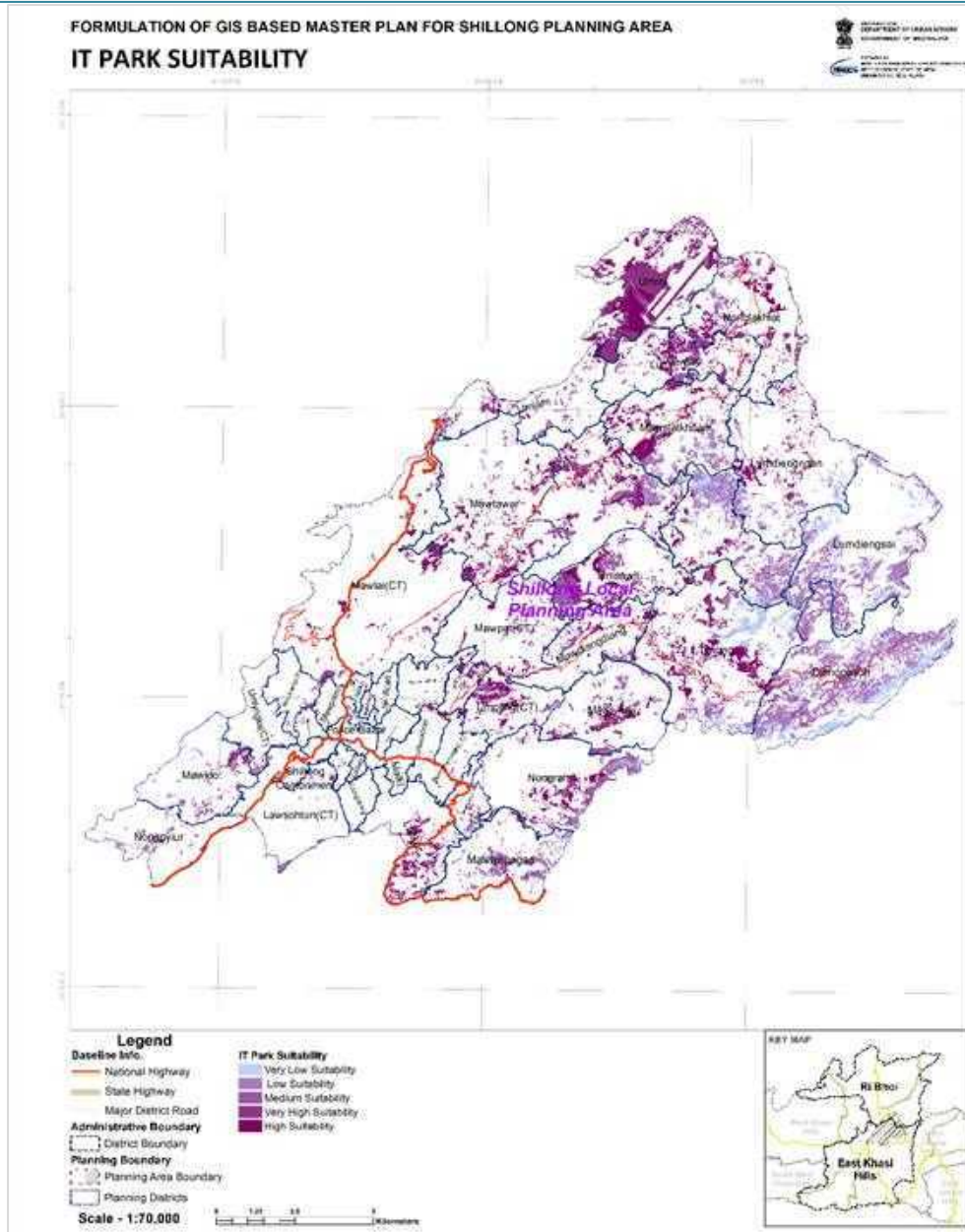


Figure 4-21: IT Park Suitability

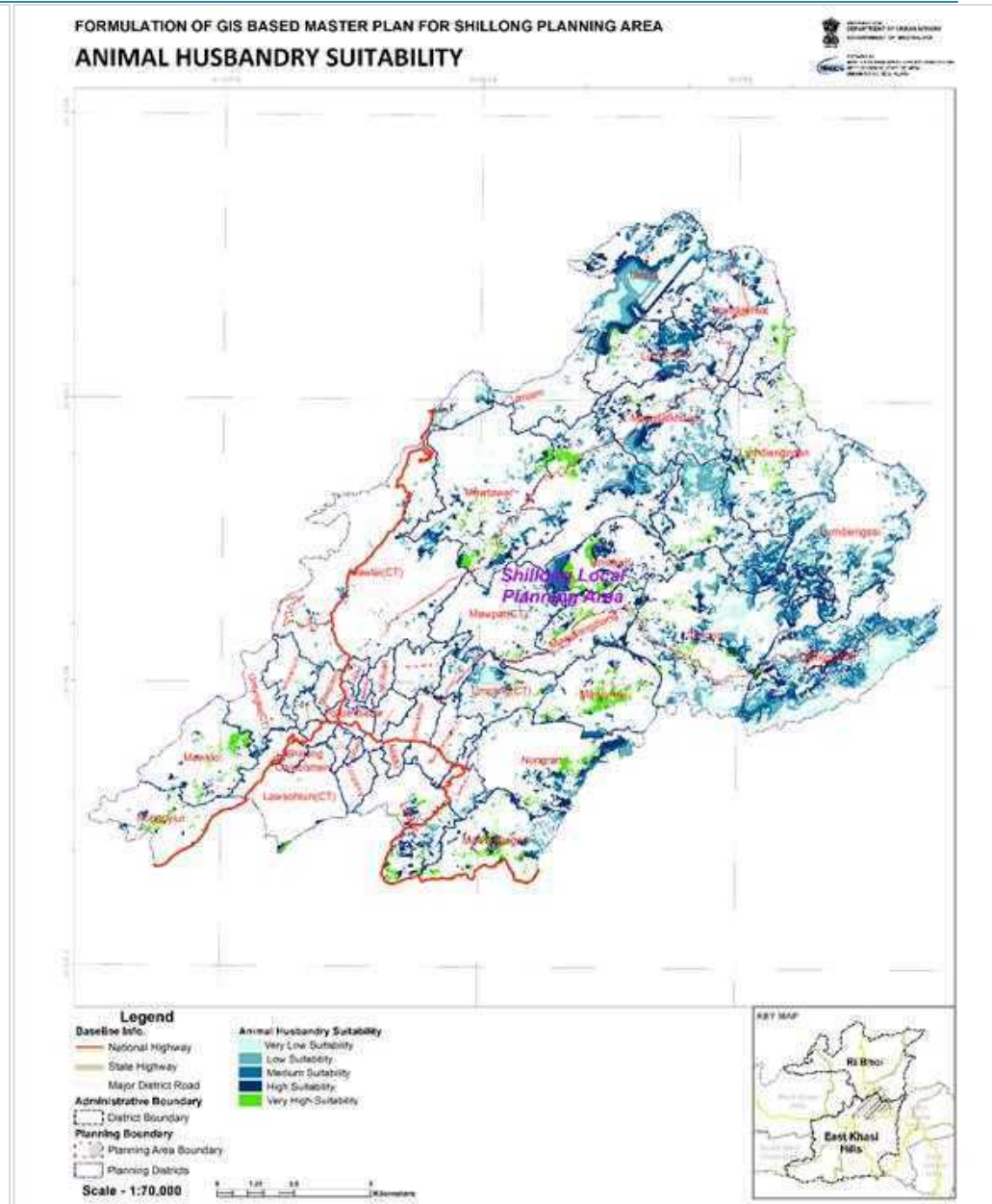


Figure 4-22: Animal Husbandry Suitability







## 5 HOUSING

### 5.1 INTRODUCTION

Shillong being primarily tourist destination has a typical characteristic feature that of a cosmopolitan character developed since establishment. However, the existence of the geographic area's original people, as well as their residential locations, typology and style, housing condition, and evolution over the decades cannot be overlooked. This is because they add to the diversity to the city as in the peri-urban areas and fringes and gives a character to the place that is much overlooked. This is not only in the socio-economic status but also in the housing scenario as a whole in Shillong Planning Area (SPA).

The housing scenario in Shillong Planning Area has been analysed by dividing into following distinct divisions:

- Shillong Urban Agglomeration area
- Adjoining 54 Villages

SPA has a very diverse and mixed housing system (RAY 2009 Report). Even after possessing a well-planned Shillong Cantonment Board and an equally dominant municipal and urban agglomeration area comprising of 10 census towns which is supported with fifty four (parts) villages in its outer fringes, yet the diversity even exists in its micro scale level too, for instance even the fringe regions have a mixed housing system consisting of not only the tribal characteristics but also the typical village housing character which is much under the influence of expanding urbanization.

The existing status of housing in Shillong Planning Area is governed by three major factors:

1. **Rapid Urbanization:** more inherent migration due to job opportunities and advanced urban development (though at a small level) and the increase in population is adding to the housing demand.
2. **Socio-Economic Diversity and Its Influences:** The wide variety of social and economic status of the society adds to the housing challenge. In addition, homelessness is a major challenge due to the existence of underdeveloped area and their expansion due to migration.
3. **Dichotomy in various housing pockets:** This adds to the din since there is a strong requirement of matching up the Shillong Cantonment Board and an equally dominant municipal and urban agglomeration area comprising of 10 census towns and fifty four (parts) villages in its outer fringes with the similar privileges.

All this has resulted in a diverse yet haphazard growth, which is continuously building pressure on the urban land and the land prices that are soaring. The direction has mainly been in the north – east direction and the east, though The Shillong range on the southern

edge of the master plan area is a reserved forest. This acts as impedance for future expansion of the city. Also On the western part exists, the Umiam River and the Rait Khwan Reserve Forest security hindering any form of development and future expansion of the city.

## 5.2 HOUSEHOLD NUMBER INFORMATION

The household number information is an important criterion to determine various other facets linked within the urban agglomeration and therefore it is necessary to assimilate the same and decide the contribution of each in forming the total no. of households.

### 5.2.1 SHILLONG PLANNING AREA

The Shillong Municipality has 36% contribution for the no. of households to the Planning area as being 31,025 within a small geographical area of 10.2 km<sup>2</sup>, while the 54 villages has 13% (10733) of the total households within a left area, thus it is most sparsely populated. This adds to the fact of maximum density in the centre of the city and then sparse population break at the fringes. The major share of the entire household distribution entails from the Shillong Municipal Board Area, 36% and Mawlai as being 12% subsequently followed by Mawpat as 10%, Umpling and Pynthormukhrah as 7% each, Nongmynsong as 4%, Lawsohtun, Umlyngka & Madanriting as 2%, Nongthymmai and Nongkseh as 1 % of the total no. of Households as shown in *Table 5-1*.

Table 5-1: No. of Households in SPA

Components of Shillong Planning Area	No. of Households
Shillong (CB)	2473
Shillong (MB)	31025
Mawlai (CT)	10661
Pynthormukhrah (CT)	5755
Nongmynsong (CT)	3242
Mawpat (CT)	8691
Umpling (CT)	5949
Nongthymmai (CT)	1144
Madanriting (CT)	1814
Nongkseh (CT)	982
Umlyngka (CT)	1450
Lawsohtun (CT)	1623
54 Villages	10733
<b>Total</b>	<b>85542</b>

Source: Census of India 2011

### Overall Household Distribution

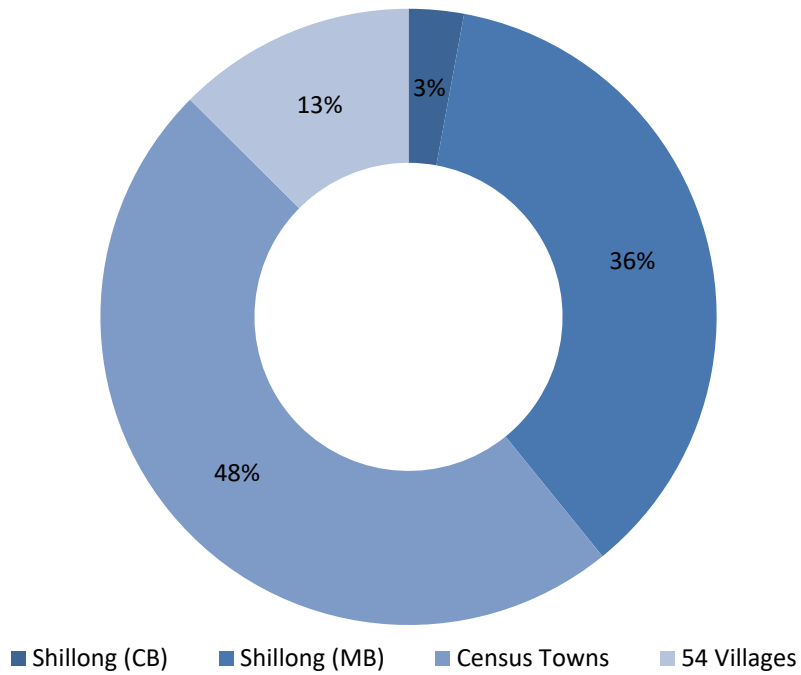


Figure 5-2: Overall Household Distribution

### Household Distribution in Shillong Planning Area

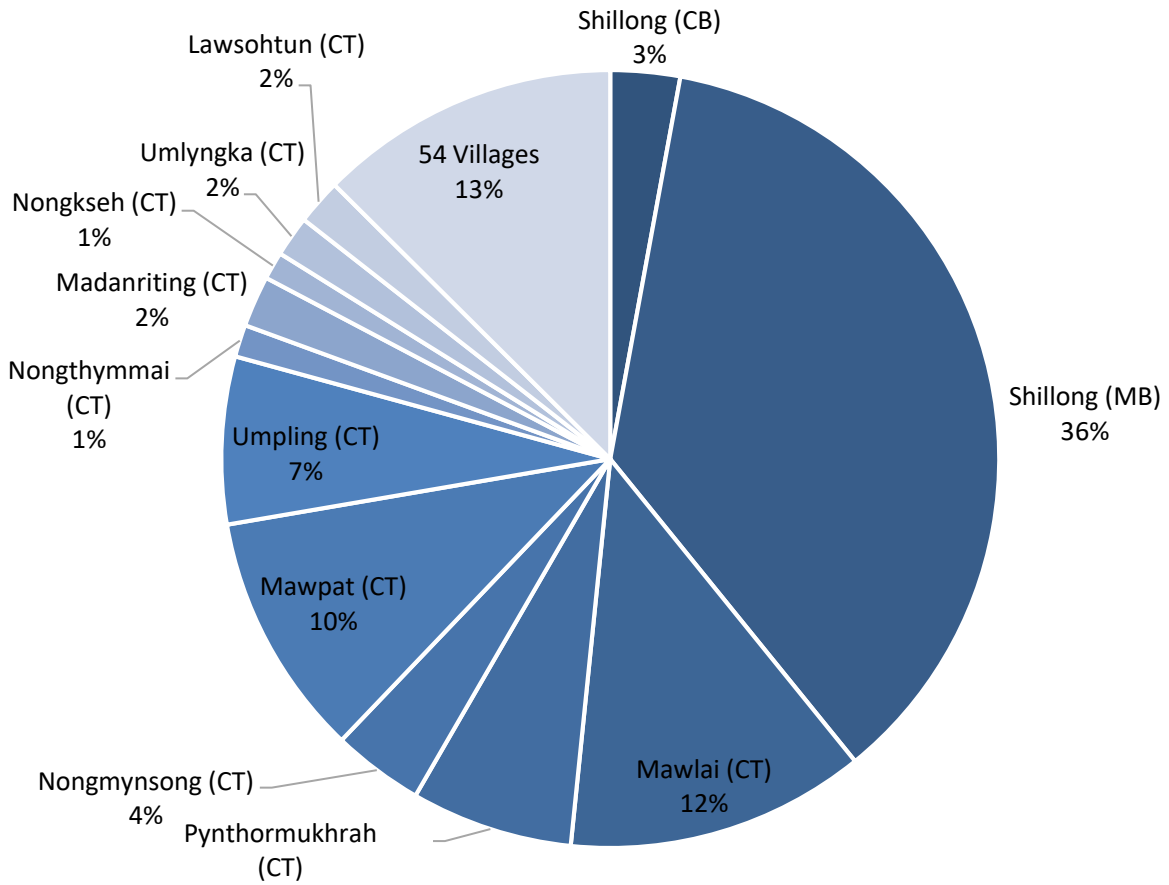


Figure 5-1: Household Distribution in Shillong Planning Area

## 5.2.2 HOUSEHOLD BREAK-UP FOR WARDS (SHILLONG MUNICIPAL BOARD)

The residential density distribution gives an idea of the areas under congestion and areas, which are under-utilized for land. It gives an idea how and in what areas there is more intensity and scope for development and wherein the control is required (Figure 5-3).

- Congestion persists in Shillong Municipal Board as per the households distributed over a smaller area as compared to the census towns and the adjoining villages. Overall, there are 3044 Households per square km in SMB area.
- Ward 21 shows a residential density of 28527 Households per square km and is excessively high showing no scope of future development
- It must be noted that wards 1, 6, 10, 12, 13, 14, 17, 18, 20, 24 and 25 have comparatively a higher proportion of density distribution; therefore, there is a lesser chance for future housing development at these locations.
- In addition, wards 5, 23 have seen a recent sharp increase and developmental change. Therefore, there are more chances to grow and face rapid urbanization and growth. In addition, negative growth has been observed in ward 4, 6, 18, 19, 22 & 24.
- Wards 2, 3, 4, 7, 8, 9, 11, 15, 16, 17 19, 22, 26 & 27 have a comparatively low density but no scope for future housing projects since the land available is in small pockets.
- Underutilized land in Mawlai, Mawpat, Nongkseh, Umlyngka and Lawsohtun in terms of residential development.
- Pynthormukhrah, Nongmysong, Nongthymmai and Madanriting shows a residential density above 2000 households per square km and is progressively increasing

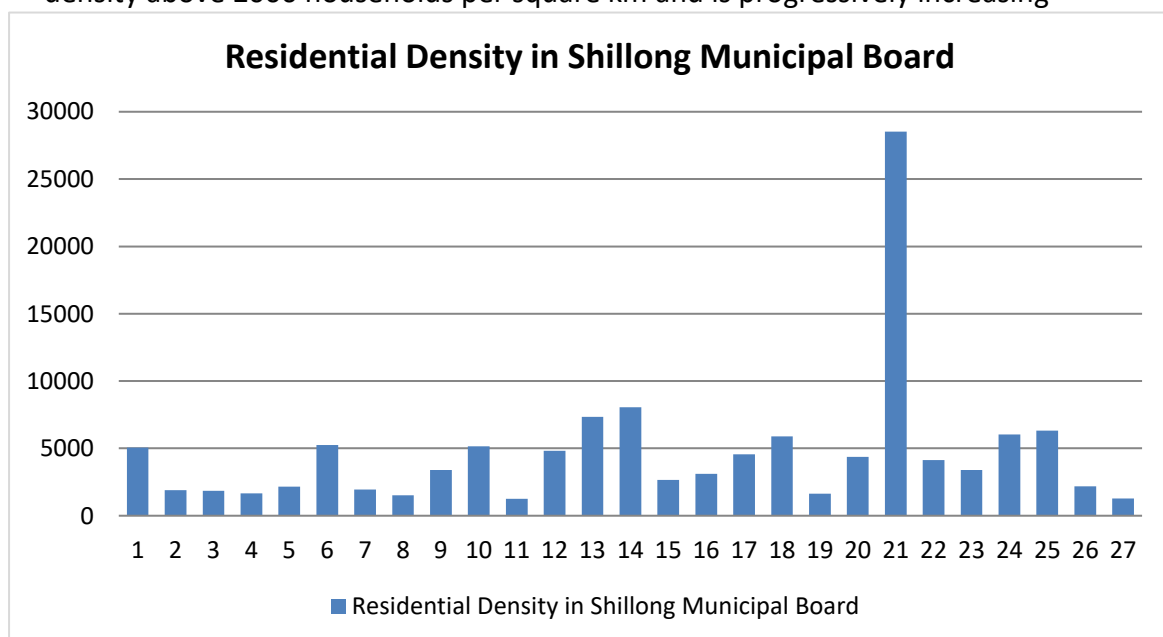


Figure 5-3: Residential Density in Shillong Municipal Board

- The adjoining 54 villages on the other hand show a residential density of 49 households per square km and call in for decentralization of development towards them.

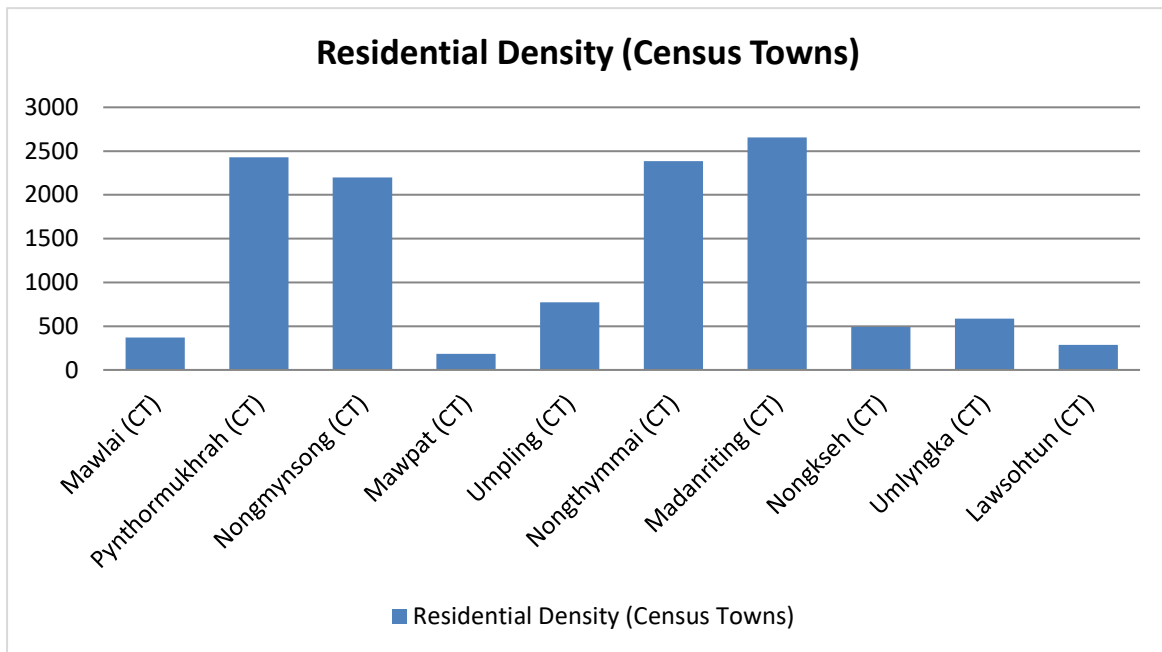


Figure 5-4: Residential Density in Census Towns

### 5.3 HOUSEHOLD SIZE DISTRIBUTION

Mawpat, Umlyngka, Lawsohtun and the adjoining 54 villages have relatively larger household sizes as compared to Shillong Municipal Board and the other Census Towns, probably due to smaller and nuclear families preferred in the central region. Therefore, there is a chance of increasing housing demand due to nuclear family formation in the suburbs and this has to be catered.

Mostly 4.4 - 5.1 is the household sizes as it varies; however, considering tendency of mutation of households to form nuclear families, the least value of household size (4.4) has been taken for housing stock calculations (*Table 5-2*).

Table 5-2: Household Distribution

Components of Shillong Planning Area	Household Size
Shillong (CB)	4.8
Shillong (MB)	4.6
Mawlai (CT)	5.2
Pynthormukhrah (CT)	4.7
Nongmynsong (CT)	4.6
Mawpat (CT)	5.4
Umpling (CT)	4.7
Nongthymmai (CT)	4.4
Madanriting (CT)	4.9
Nongkseh (CT)	4.9

Umlyngka (CT)	5.1
Lawsotun (CT)	5.1
54 Villages	5.1

#### 5.4 HOUSING CONDITION AND OBSOLESCENCE FACTOR

It is very important to conduct a due diligence regarding the condition of houses for housing demand calculations and further proposals and developments. In Shillong Municipal Board, there are 31,025 households as per 2011 census data, among which 75.7 % are in good condition, 22.1% are in liveable condition and 2.1% are in dilapidated situation. Similarly, The Shillong Cantonment Board has 2,473 Households and 2.2 % households are in dilapidated situation (Table 5-3).

The 10 census towns have total 41,311 households among which 73.75% are in good condition, 24.25% are in liveable condition and 2.01% are in dilapidated condition.

In addition, the 54 adjoining villages in Shillong Planning Area has 10,733 Households (Table 5-4). Out of which 44.54% are in good condition, 48.7% are in liveable condition and 6.76% are in dilapidated situation.

Table 5-3: Housing Condition in SPA

Components of SPA	No of Households	Good	Liveable	Dilapidated
Shillong (CB)	2473	1872	549	52
Shillong (MB)	31025	23486	6857	683
Mawlai (CT)	10661	7862	2584	214
Pynthormukhrah (CT)	5755	4244	1395	116
Nongmysong (CT)	3242	2391	786	65
Mawpat (CT)	8691	6410	2107	175
Umpling (CT)	5949	4387	1442	120
Nongthymmai (CT)	1144	844	277	23
Madanriting (CT)	1814	1338	440	36
Nongkseh (CT)	982	724	238	20
Umlyngka (CT)	1450	1069	351	29
Lawsotun (CT)	1623	1197	393	33
54 Villages	10733	4780	5227	726
<b>Total</b>	<b>85542</b>	<b>60605</b>	<b>22646</b>	<b>2290</b>

Table 5-4: Housing based on type of Structure

Components of SPA	No of Households	Pukka	Semi-Pukka	Kutcha
Shillong (CB)	2473	1281	1105	87
Shillong (MB)	31025	21097	6515	3413
Mawlai (CT)	10661	7249	3198	214
Pynthormukhrah (CT)	5755	3913	1727	115
Nongmysong (CT)	3242	2205	972	65

Mawpat (CT)	8691	5910	2607	174
Umpling (CT)	5949	4045	1785	119
Nongthymmai (CT)	1144	778	343	23
Madanriting (CT)	1814	1234	544	36
Nongkseh (CT)	982	668	294	20
Umlyngka (CT)	1450	986	435	29
Lawsotun (CT)	1623	1104	487	32
54 Villages	10733	4580	3928	2225
<b>Total</b>	<b>87896</b>	<b>55050</b>	<b>26296</b>	<b>6550</b>

Table 5-5: Household per Room and Congestion Factor

Total Married Couples	Couples having No independent sleeping room	Congestion factor
66621	1687	2.53

## 5.5 HOUSING STOCK AND SHORTAGE CALCULATIONS

The housing need has been analysed using the urban housing need model as used for the evaluation of urban housing shortage from the “Report of Technical Group: 11<sup>th</sup> Five Year Plan”. The model is as follows

$$\text{Total Current Urban Housing Shortage/Need} = A + B + C + D$$

Where:

### A: Excess Households acceptable over housing stock

Acceptable housing Includes:

- Pukka /Permanent
- Semi-Pukka / Semi-Permanent, and
- Serviceable Kutcha

### B: Congestion in Households

Derived from Congestion Factor (percentage of no. of Households) i.e. number of households requiring a separate dwelling unit because of congestion, congestion evaluated from being dependant on various different types of socio-economic factors.

### C: Obsolescence in Households

Derived from Obsolescence Factor (% of no. of households), i.e. a non- serviceable factor for houses with age greater than 35 or 40 years and with also houses with age greater than 80 years considering them for dilapidation.

## D: Upgradation of Kutcha Houses

Following the similar pattern the housing Need for Rourkela was a for both the Rourkela Municipal area and the Steel Township separately, as due to the dichotomy existing as prevalent in the city and to understand the pattern for it by computing the housing shortage in both the types of areas.

### 5.5.1 HOUSING DEMAND GAP

The Master Plan proposes to facilitate the provision of a fully serviced dwelling unit for each family and reduce the gap between housing shortage and supply through innovative measures. The housing shortage has been calculated for Shillong Planning Area in do nothing scenario.

**Table 5-6: Housing Demand Assessment**

Year	Population	Decadal Growth Rate	Housing Stock available	Required Housing Stock	Houses Gap
2011	421401		85542	95773	10231
2021	570670	35%		129698	44156
2031	645346	13%		146670	61128
2041	720002	12%		163637	78095

As indicated in *Table 5-6* the number of households for the year 2021, 2031 and 2041 have been calculated assuming an average household size of 4.4. Presently it has a shortage of 10,231 dwelling units as it has 85,542 residential houses against 95,773 households as per 2011 census. It further needs 78,095 dwelling units for the projected year 2041.

Total Houses required in the planning area for the projected year 2041:

- Total houses required based on urban area calculation: 78,095 dwelling units.
- Total houses required based on obsolescence factor: 2,290 dwelling units (1564 urban area + 726 rural area).
- Total houses required based on type of structures: 6,550 dwelling units.
- Total houses required based on Household per Room and Congestion Factor: 1,687 dwelling units.
- Total houses required in the Shillong Planning Area by 2041: 88,622 dwelling units.

### 5.5.2 POPULATION ALLOCATION AND DISTRIBUTION

The following are the parameters considered while deciding on the population allocation in different areas and thus their subsequent distribution:

- The area required for housing shortage has been considered subsequently absorbed in the already existing residential areas with time.



- It has been observed that there will be in-migration of new migratory population in the Shillong Municipal area and outmigration from the Shillong Municipal area as part of natural growth.
- In addition, it has been observed that there will be no outmigration from the Census towns and the adjoining 54 villages since the areas are the new specks of development and new development opportunities. Therefore, only in-migration shall occur as an expansion of the residential area of the SPA.

## 5.6 COMMUNITY ORIENTED LAND POOLING SCHEME

Land pooling system is a Town Planning Scheme (TPS) wherein the State or development agency acquires parcels of land from various individuals, plans and designs the consolidated parcels of land, provides services, infrastructure, roads etc., and returns the developed land to the owners. It is a land-assemble strategy that focuses on amalgamated development of land parcels after which the serviced lands returned to the owners. A certain portion of the land is deducted as compensation towards the cost of infrastructure.

This model favours the landowners, as the process is equitable, participatory, and inclusive and gives the landowners a stake in the city's future development. The smaller parcels of land are not neglected and an integrated development follows. Infrastructure and services are provided by the State and the development of the buildings is left to the landowners. Infrastructure and other services also increase the value of the land. This model is innovative, as serviced land becomes the primary mode of exchange instead of money thus reducing the pressure on State's finances.

This system will prove to be beneficial to the existing unserved land as integrated infrastructure and other services shall be provided. The parcels of land are planned and developed uniformly and no gaps are left behind. This system also avoids forcible land acquisition and displacement of the landowners or the issues of lesser compensation. The landowner gets majority of their land back along with benefits of serviced lands. Many City and State development authorities have adopted this method and have executed the model with success within Indian and many other countries around the world. Amravati, the new capital city of Andhra Pradesh have efficiently proved to be the largest successful case study of land pooling in India.

### 5.6.1 LAND POOLING MODEL FOR SHILLONG PLANNING AREA

Meghalaya being a 6<sup>th</sup> Schedule state, all the land belongs to the natives of the state. Around 97% of the state land falls under sixth schedule and therefore, the government owns less than 3% of the remaining land. Hence, development becomes very difficult, as it is difficult to acquire the land. Land is the most important asset to them and many local landowners do not even register their land with the government.

The complexity of land acquisition was a major factor for the prior Master Plan's unsuccessful endeavours. Hence, a new model has to be adopted for the sixth schedule lands so that land parcels can be collected effectively for development without hurting the sentiments of the locals or without dislocating the locals from their own land.

The model of land pooling shall adopted where the locals will be encouraged to pool in their clan land or individual lands. In this process, there is no fear of losing their land to the government. The amalgamated land will be developed by the development authority and given to the locals after a part of the land is retained.

### 5.6.2 DETAILS OF LAND POOLING MODEL FOR SHILLONG PLANNING AREA

The amalgamated land holding of size 100ha to 200ha can be pooled in by the clan or individuals for development to Authority (MUDA). The department will provide services to the land holding like roads, water supply, sewage, power supply, parks and other required amenities as per the requirement of the area and return 80% of the serviced land to the respective landowners. The 20% of the serviced land will become a part of the State land as compensation to the expenditure to the services provided. The 20% land will be relinquished by the authority for development.

The details of the Land Pooling model are

- The model will work in 80:20 ratio, after developing the land parcel; the development authority will keep 20% of the land for the services and return the remaining 80% to the landowners.
- The services provided will include
  - Water supply
  - Roads
  - Power lines
  - DEWATS for sewage treatment
  - Parks

The percentage of the distribution of the land for services from the 20% of area are

Table 5-7: Distribution of Leveraged Land

Land distribution	Services/Infrastructure
12%	Roads
5%	Parks/ community spaces
3%	Other Services

### 5.6.3 ADVANTAGES OF THE MODEL

- Homogenous development of the land.
- Integrated development along with planned roads, infrastructure and services provided.
- Provision of planned parks and other public and community spaces
- All the upcoming houses or other buildings will have easy provision to services.
- The cost of land rises, landowners may choose to sell their serviced property to another party.
- The natives will not lose their land yet they will be a part of this participatory process of development.
- This is an equitable and transparent model with a win-win situation for the State as well as the landowners as the primary objective of the State is to develop the land and provide services while for the landowners, they will get the maximum portion of their land back.
- This system will end the land acquisition system along with all its downfalls.



## 6 URBAN INFRASTRUCTURE

Urban Infrastructure includes

- Physical Infrastructure like Water Supply, Drainage, Solid Waste Management (SWM) and Power.
- Social Infrastructure like Health Service and Educational Service.

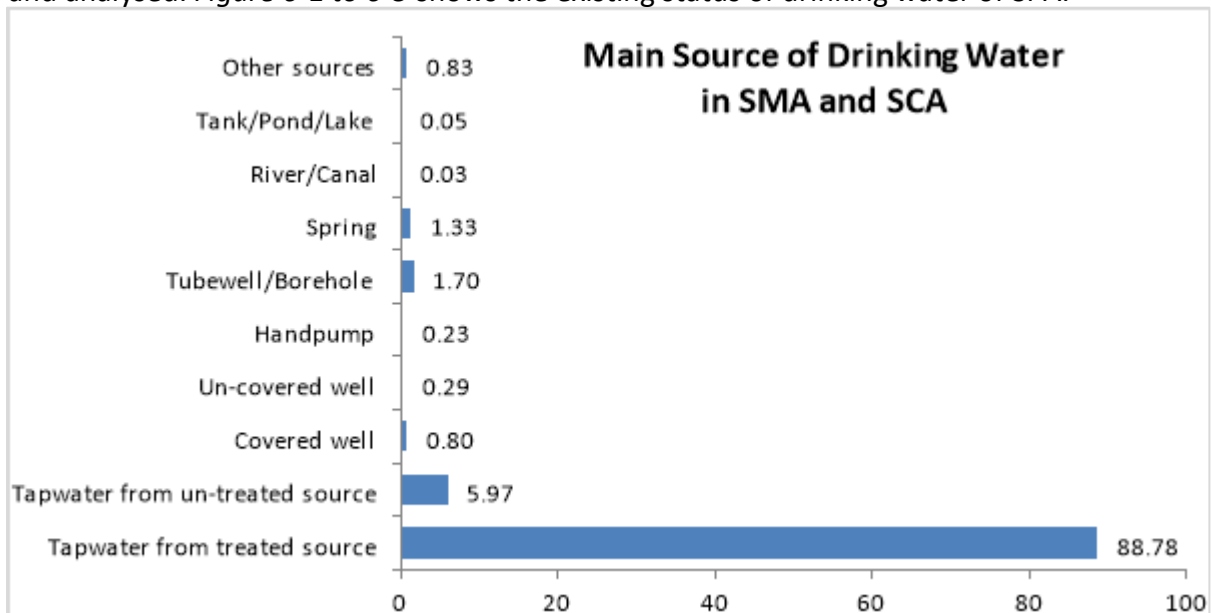
### 6.1 PHYSICAL INFRASTRUCTURE

#### 6.1.1 WATER SUPPLY

Development depends on the right balance of urban development alongside infrastructure growth. Urban physical infrastructure investment by water utilities is essential in order to keep pace with population growth, meet regulations, deliver adequate services, and protect public health and the environment. These large expenditures in order to maintain and improve water supply, wastewater management, and water reuse require that utilities create a master plan for future needs, include power distribution and solid waste management. The analysis would guide for planning of urban infrastructure according to the deficiencies analysed and the future demands that will arise due to the increase in urban population. The planning area encompasses three watersheds: Umiam, Umkhen, and Umsiang.

##### 6.1.1.1 SOURCES OF WATER

Rain is precipitated upon the surface of the earth as meteorological water and may be considered as the original source of all the water supplied. Surface water and ground water are the main source of drinking water supply for the existing area. As per the primary survey conducted in the planning area, the various sources of drinking water has been identified and analysed. *Figure 6-1 to 6-3* shows the existing status of drinking water of SPA.



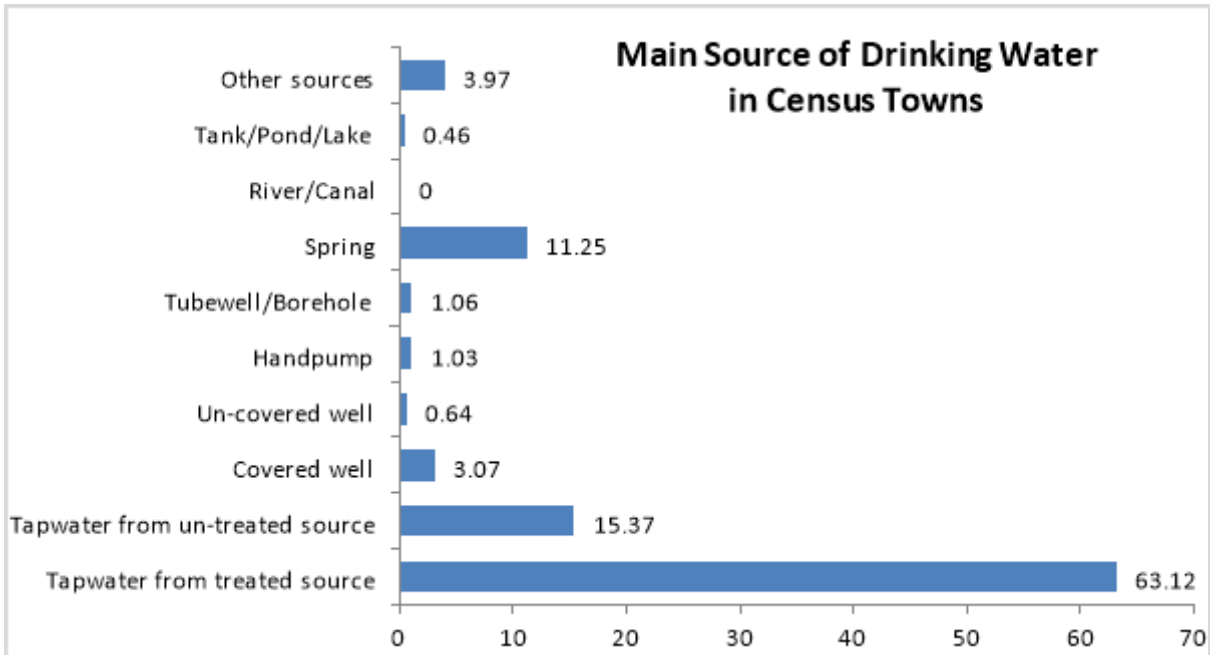


Figure 6-2: Main Source of Drinking Water in Census Towns

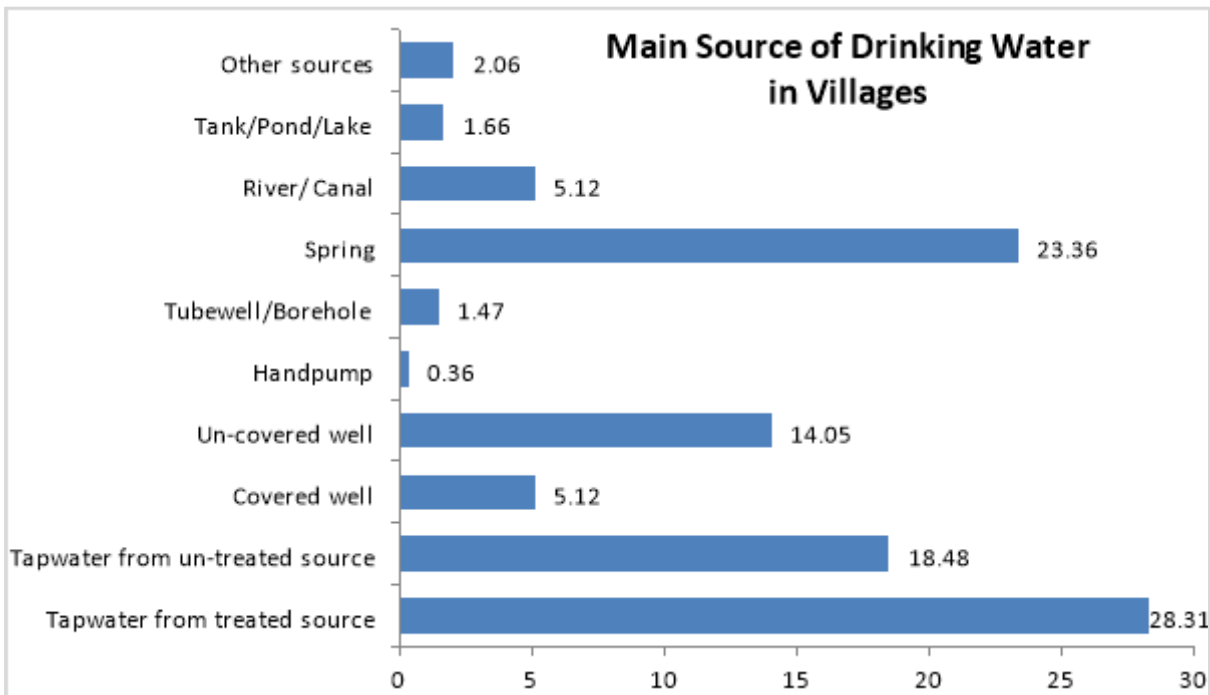


Figure 6-3: Main Source of Drinking Water in Villages

Main source of water supply for existing Shillong Municipal Area is the Mawphlang Dam and is built over Umiew River. A reservoir of capacity 9.145 million cubic meter has been built to enable pumping of 11.3 MGD (Million Gallons per Day) of water to cater to the drinking water needs. Groundwater resources are highly variable in Shillong areas. Groundwater resource are mainly dependent on topography, zone of weathering, and fracturing in rocks (Figure 6-4 to 6-6).

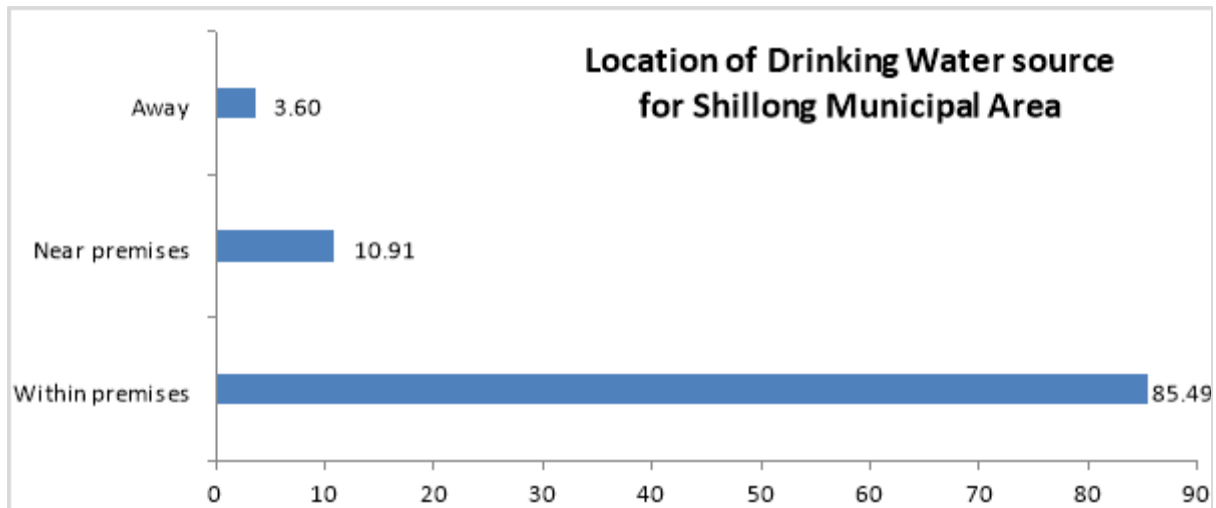


Figure 6-4: Location of Drinking Water source for Shillong Municipal Area

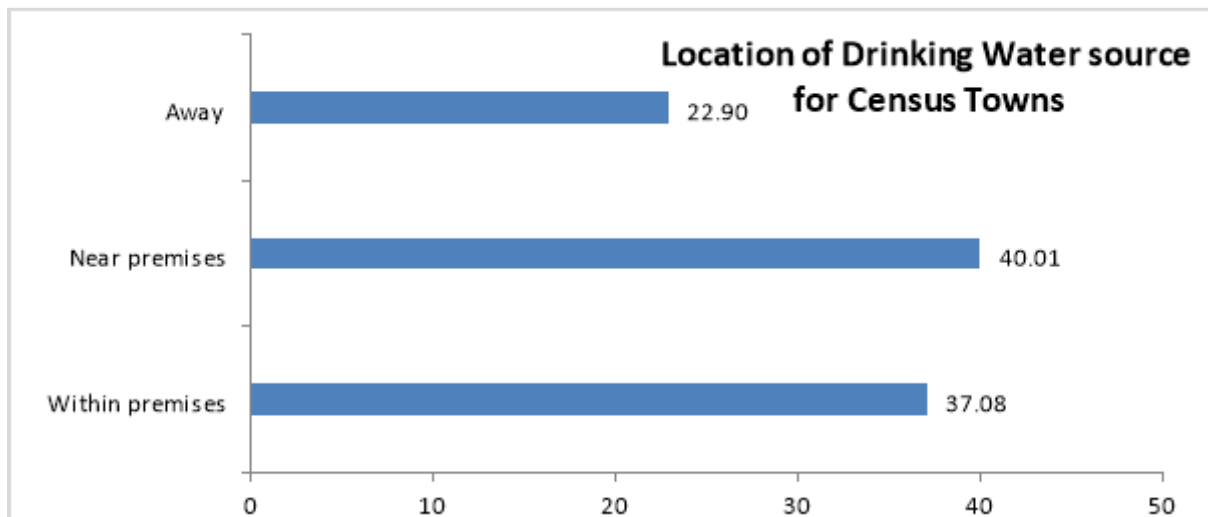


Figure 6-5: Location of Drinking Water source for Census Towns

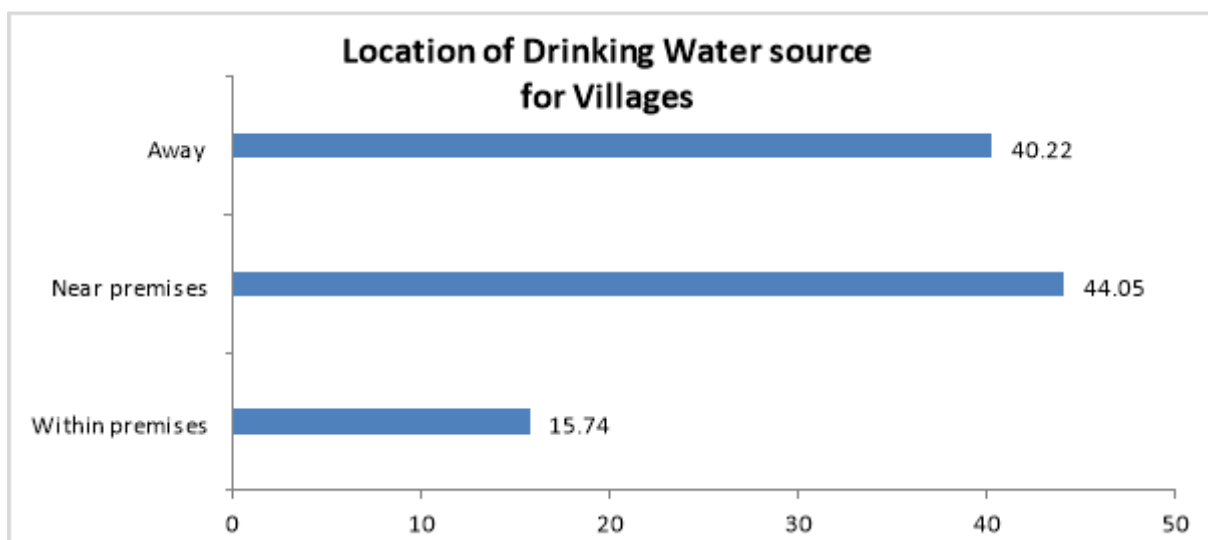


Figure 6-6: Location of Drinking Water source for Villages

Accessibility of ground water in hilly region is showed within the shape of springs, seepages, wells and bore well of constrained/ nominal yield. Groundwater happens beneath semi-confined condition. Quartzite and valley fills (in Polo range) constitute the major aquifer framework within the region. Ground water development in the urban agglomeration is both by dug wells generally confining to the weathered zone and bore wells, which mainly tap, fractured zone in the hard rocks. These fractures sometime extend very deep occurring even beyond 60 MBGL (Meters Below Ground Level), but otherwise generally close before 60 m depth. From the well stock information it was found that in dug wells depth to water level varies from 0.50 MBGL (at Polo) to 5.56 MGBL (at Pynthormukhrah). In post monsoon period, it is from 0.15 MGBL to 5.10 MGBL at the same locations respectively.

Average seasonal water level fluctuation is 1.19 m with minimum fluctuation of 0.35 m at Polo and maximum 2.95m at Mawlai Mawroh. Yield capacity test in the near surface aquifers in the Shillong area establishes that weathered metabasic rocks have a moderately high yield potential. Study of lithological and hydrological data collected from shallow bore wells drilled in Shillong area have shown that the most productive area is the Pynthormukhrah area. The wells were drilled within quartzites and metabasic rocks with depths ranging from 30.00 m to 110.00 m. The yield of the boreholes ranged from 5.0 m<sup>3</sup>/hr to 40.0m<sup>3</sup>/ hr.

Table 6-1: Agencies of Water Supply in Shillong Planning Area

Agency	Source	Destination
Shillong Municipal Board	Mawphlang Dam	SMB is Responsible for planning distribution in the area
Public Health Engineering Department	Mawphlang Dam	planning and construction of Water supply schemes for the entire planning area
Shillong Cantonment Board	Mawphlang Dam	Cantonment Board takes bulk water from SMB and undertakes distribution in its area.
Dorbar's	Springs/streams/ Bore well	For other areas supply is being provided by the PHED

Source: City Development Plan for Shillong, 2009 (JNNURM)

For purposes of the water production and distribution, the City is covered by SMB, SCB, PHED and Dorbar's. The investigation, planning and execution agency for the entire area is with the PHED.

SMB and PHED provide the bulk of the water supply services in the city. The water sources are rivers, streams and springs. The SMB controls several springs and stream. In areas beyond the PHED networks, some Dorbar has developed small water schemes supplying the water through stand posts. Springs are also used by nearby residents to meet their water needs. Households without access to public or private services depend upon supply made



tankers, purchase water from private vendors / operators, or depend on private bore wells or hand pumps. The total potable water supply quantum to Shillong City catered from two surfaces sources viz., rivers and springs. The present requirement of Greater Shillong Area (GSA) by the year 2041 is 45.17MLD (Million Litres per Day).

#### 6.1.1.2 PRESENT WATER SUPPLY STATUS

GSWSP (Phase I & II) which was originally designed to cater supply to Greater Shillong Area and designed to cater supply to enrooted to villages for a total population of 40,000. Following the necessity to delink the supply to villages from that of Greater Shillong Area, state government has sanctioned a scheme for supply of water to the en-route villages separately and from a separate source to delink the GSWSP (Greater Shillong Water Supply Project) from en-route villages. The scheme is ongoing. Phasing as per *Table 6-2*.

Table 6-2: GSWSP Phasing

GSWSP	Phase I	Phase II	Phase III	Total
<b>Pumping Capacity</b>	51.30 MLD		24 MLD	75.3 MLD

Source of the project is the River Umiew. A mass gravity concrete dam across the river has already been constructed under Phase II of the GSWSP. The project (GSWSP Phase III) does not bear any provision for further enhancement/augmentation of the source.

#### 6.1.1.3 WATER SUPPLY BY PHED

Main water source for Shillong is from a dam across Umiew River at Mawphlang, which is about 25 km from Shillong. The pumping of water from the river to the treatment Plant is undertaken in three stages at a height of about 221 meters, the impounded water is carried to two RCC wells of 8.20m clear diameter and about 49m in height each. A pump house on top of the wells has been constructed and two Kirloskar make vertical turbine pumps coupled with two of Kirloskar Electric make motor of 300KW/400 HP each capable of delivering 180 litres per second (LPS) continuously pumps water for 24 hours a day against a total head of 122m. There are six pumps and motors available for first stage pumping.

#### 6.1.1.4 EXISTING METHOD FOR WATER TREATMENT

Water pumped from river Umiew is released to Shillong city after adequate treatment in rapid gravity filter preceded by a clariflocculator and subsequent disinfection through chlorination.

Table 6-3: Water Tanker Distribution in SPA

Sl. No.	Circle	No. of serviceable water tanker	Remarks
1	Shillong Planning Area	505	

Source: Geodatabase for Shillong Planning Area, 2022

### 6.1.1.5 WATER REQUIREMENT FOR TOWNSHIP

Clean and safe water supply is one of the prime objective requirements for the township. The rapid growth in population and urbanization overburdened the water supply system. Proper management of available water resources, prevention and control of wastage of water can reduce the water stress of area. Per capita water supply for the design of various systems suggested in the 'Manual on Water Supply and Treatment' of the Central Public Health Engineering Organization of the Government of India. The water supply standards recommended by CPHEEO for towns with water pipes but no sewer system are 70 lpcd (litre per capita per day).

### 6.1.1.6 PROJECTED WATER DEMAND IN DIFFERENT PLANNING ZONES

For preparation of water demand for the entire SPA has been divided into different parts based on the Municipal wards, Municipal Cantonment Board, the Census Towns and the Villages. The water demand for each planning zones are based on projected population for the year 2021, 2031 and 2041. The total water demand in the existing area as in 2021 is 34.72 MLD, 2031 is 39.95 MLD and 2041 is 49.6 MLD.

For the current water supply, majority source is surface water from Mawphlang Dam, which is built over Umiew River. The annual ground water recharge is calculated using the following empirical formula,

$$Re = 0.35*(P-600)$$

For areas with rainfall above 2000 mm, where "Re" is the annual recharge in mm and "P" is the annual precipitation in the planning area. At present, they are drawing 162872675 m<sup>3</sup>/year, which is almost 25% of the recharge rate. This needs to be stored through rainwater harvesting strategies to meet the water demands. The calculations are shown in *Table 6-4*.

Table 6-4: Ground Water Recharge

Annual Precipitation	2213	mm
Volume for entire planning area of 288.5 sqkm	638450500	m <sup>3</sup> / year
Annual Recharge	564.55	mm
Volume for entire planning area of 288.5 sqkm	162872675	m <sup>3</sup> / year
Hence, 25.5 % of recharge is currently happening.		

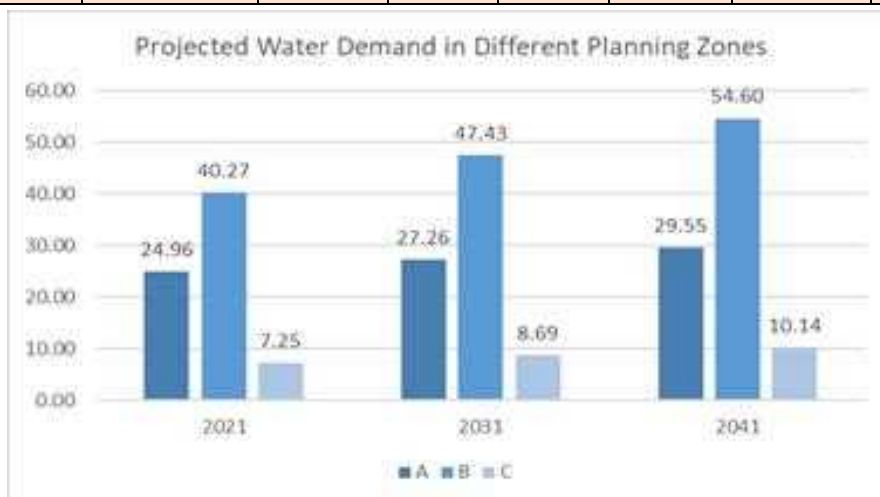
Current (2021) water supply demand is 72.47 MLD @70 lpcd. Projected population for the year 2041 is 6,45,346. For the year 2041 types of water considered are as per CPHEEO guidelines and URDPFI guidelines –

- Residential demand (R) – 70 lpcd
- Industrial and Commercial demand (I & C) – 50 lpcd
- Firefighting purpose (F) – 1 lpcd
- For public purposes – 5% of the above total
- To compensate losses – 15% of the above total

The total demand calculation is done by using the above-mentioned standard as shown in *Table 6-5*.

**Table 6-5: Projected Water Demand in Different Planning Zones**

Zones	Projected Population	R (MLD)	I & C (MLD)	F (MLD)	Total (T1)	Public use (T2) (5% (T1)+T1)	Losses (T3) (15%(T2)+T2)
A	170852	11.96	8.54	0.17	20.67	21.71	24.96
B	275593	19.29	13.78	0.28	33.35	35.01	40.27
C	49589	3.47	2.48	0.05	6.00	6.30	7.25
<b>Total of Year 2021</b>	<b>496033</b>	<b>34.72</b>	<b>24.80</b>	<b>0.50</b>	<b>60.02</b>	<b>63.02</b>	<b>72.47</b>
A	186544	13.06	9.33	0.19	22.57	23.70	27.26
B	324639	22.72	16.23	0.32	39.28	41.25	47.43
C	59507	4.17	2.98	0.06	7.20	7.56	8.69
<b>Total of Year 2031</b>	<b>570690</b>	<b>39.95</b>	<b>28.53</b>	<b>0.57</b>	<b>69.05</b>	<b>72.51</b>	<b>83.38</b>
A	202237	14.16	10.11	0.20	24.47	25.69	29.55
B	373685	26.16	18.68	0.37	45.22	47.48	54.60
C	69424	4.86	3.47	0.07	8.40	8.82	10.14
<b>Total of Year 2041</b>	<b>645346</b>	<b>45.17</b>	<b>32.27</b>	<b>0.65</b>	<b>78.09</b>	<b>81.99</b>	<b>94.29</b>



**Figure 6-7: Projected Water Demand in Different Planning Zones**

Table 6-6: Estimation of Capacity of Water Supply Shortage

Year	Estimated Water Demand	Available Capacity of Water Supply	Gap in water supply demand (capacity)
2021	72.47 MLD	75.3 MLD	2.83 MLD
2031	83.38 MLD		8.08 MLD
2041	94.29 MLD		10.91 MLD

Table 6-7: Estimation of Shortage in No. of Water Tanks Zone wise

Zones	Available Water Tanks	Required Water Tanks		Shortage of Water Tanks	
	Year 2021	Year 2031	Year 2041	Year 2031	Year 2041
ZONE A	178	224	243	46	19
ZONE B	286	391	451	105	60
ZONE C	107	92	102	-15	9
<b>TOTAL</b>	<b>571</b>	<b>707</b>	<b>795</b>	<b>136</b>	<b>88</b>

Table 6-8: Estimation of Required No. of Water Tanks PD Wise

PD No.	Name	Available Water Tanks	Required Water Tanks		Shortage of Water Tanks	
		Year 2021	Year 2031	Year 2041	Year 2031	Year 2041
	Shillong (MB)		205	222		
10	Shillong Cantonment		19	21		
	<b>ZONE A</b>	<b>178</b>	<b>224</b>	<b>243</b>	<b>46</b>	<b>19</b>
6	Laitkor		19	22		
11	Lummawbah		6	8		
16	Pynthormukhrah(CT)		49	57		
17	Nongmynsong(CT)		27	32		
18	Nongthymmai(CT)		60	67		
19	Lawsotun(CT)		15	17		
20	5th MILE		8	10		
21	Nongpyiur		4	4		
22	Mawklot		6	7		
23	Umylyngka(CT)		13	16		
24	Nongkseh(CT)		9	10		
25	Mawlai(CT)		90	103		
26	Mawpat(CT)		17	20		

27	Umpling(CT)		15	18		
28	Madanryting(CT)		53	61		
	<b>ZONE B</b>	<b>286</b>	<b>391</b>	<b>451</b>	<b>105</b>	<b>60</b>
29	Mawtawar		6	6		
30	Nongkohlew		2	2		
31	Umsawli		4	4		
32	Mawdiangdiang		2	4		
33	Mawlynrei		6	7		
34	Nongrah		24	28		
35	Mawpynthih		6	6		
36	Umiam		6	6		
37	Umsarang		2	2		
38	Saisiej		2	2		
39	Mawpdang		6	6		
40	Umroi		6	7		
41	Lumshyiap		4	4		
42	Nonglakhiat		4	4		
43	Lumdiengngan		6	7		
44	Lumdiengsai		4	4		
45	Nongtyrkhang		2	2		
	<b>ZONE C</b>	<b>107</b>	<b>92</b>	<b>102</b>	<b>-15</b>	<b>9</b>
	<b>TOTAL</b>	<b>571</b>	<b>707</b>	<b>795</b>	<b>136</b>	<b>88</b>

Hence the water supply gap estimation is done based on the GSWSP capacity for augmentation of water tanks in the planning area. Thereafter, water supply demand of 8.08 MLD by 2031, 10.91 MLD by 2041 is required to be augmented as per the analysis.

As per the data acquired from PHED, another analysis is done to find the no. of water tanks required to be provided ranging from 30,000 litres to 50,000 litres capacity as per the water tanks provisioning standard based on population forecast. This is subject to change as per the requirement in the planning districts accordingly and as per the decision of PHED.

571 tanks are available in the planning area till 2021. The analysis is done zone wise, which summarizes that 'Zone A', requires 46 tanks by 2031 and 19 tanks by 2041, 'Zone B' requires 105 tanks by 2031 and 60 tanks by 2041, and 'Zone C' requires no tanks by 2031 and only 9 tanks by 2041. In total, the planning area jurisdiction is in need of 136 tanks by 2031 and 88 tanks by 2041. For reference, Planning District wise requirement is also shown in *Table 6-8*.

## 6.1.2 FORMULATION OF WATER SUPPLY DEVELOPMENT PLAN

Urban Water Supply Network comprises a water intake system, a treatment plant, transmission and supercharger pumps, a power station, a transmission pipe, a water reservoir, a distribution hose and a water connection facility.

### 6.1.2.1 WATER INTAKE

Outside Shillong Municipality Area but within Shillong urban Agglomeration, water is supplied from the following water supply schemes, which were implemented and being maintained by PHED as shown in *Table 6-9*.

**Table 6-9: Water Supply Scheme in Shillong Agglomeration Area implemented and maintained by PHED**

Water Supply Scheme	Source	It covers
Mawlai Umsohlang Water Supply Scheme	Mawlai Umsohlang	Mawlai area
Pynthormukhrah Water Supply Scheme	Pynthormukhrah	Pynthormukhrah area
Umkhen Water Supply Scheme and Lum Demthring	Umkhen	Nongthymmai area
Nongmynsong Water Supply Scheme	Nongmynsong	Nongmynsong area

*Table 6-10* shows, Water Supply Schemes in Shillong Urban Agglomeration were implemented by PHED but maintained by the local committee.

**Table 6-10: Water Supply Scheme in Shillong Agglomeration Area implemented PHED but maintained by Local Committee**

Water Supply Scheme	Source	It covers
Madanriting Water Supply Scheme	Madanriting	Madanriting area
Pohkseh Water Supply Scheme	Pohkseh	Nongthymmai area
Lawjynriew Lumiablot Water Supply Scheme	Lawjynriew Lumiablot	

*Table 6-11* shows, Water Supply Schemes in Shillong Municipal Area were implemented by PHED and maintained by both PHED and Shillong Municipal Board.

**Table 6-11: Water Supply Scheme in Shillong Agglomeration Area implemented PHED but maintained by PHED and SMB**

Water Supply Scheme	Source	It covers
Greater Shillong Water Supply Scheme	Mawphlang Dam	Shillong Municipal area, some parts Mawlai and Nongthymmai

In Mawlai and Nongthymmai area, supply provided by the GSWSP. In the areas outside the municipality of Shillong, the supply post is more or less adequate and from a single agency that is PHED is looking after the operation, there is no problem encountered in day to day maintaining the supply.

### 6.1.2.2 WATER TREATMENT

Current Water Treatment Plant of the undertaking charged in 1986 is intended to yield 7.5 million gallon of treated water each day. The extra water treatment plant of 3.8 MGD limit is under trying. The two-water treatment plant will give a total treatment of 11.30 MGD. Treated water from the plant's unmistakable water supply incline toward various zonal supplies situated in various pieces of the state capital. Water from the zonal supplies are disseminated to shoppers through an organization of dispersion framework. In spite of the fact that the task conceives development of dam, development of dam could not prior be taken up because of asset limitation. Impermanent adaptable weir was rather built across the River Umiew promptly downstream of the admission design to give the quick advantage on fulfilment of (Phase-I). The treatment plant developed under Phase I of the venture has a limit of 34.05 MLD. Treatment involves compound coagulation, flocculation, settlement, filtration and post chlorination. An absolute length of about 30 km of lines fluctuating in size from 750 mm diameter to 150 mm diameter were laid to pass on the treated water by gravitational stream from Mawphlang towards various pieces of Greater Shillong Area and zonal supplies of all out capacity limit of about 6.81 ML were built under Phase I of the task.

### 6.1.2.3 WATER DISTRIBUTION

Water Distribution Network is to provide the required water supply pressure at each water connection point. The diameter of pipe to be used for the distribution network is in the range of 200 mm to 25 mm. The materials used for distribution pipe are steel pipe, PVC and PE pipe. The work for Package-II comprises of Survey, Engineering, design and laying of Distribution System for 12 zones with D.I. Pipelines of sizes 100 mm diameter to 450 mm diameter which shall convey water from different zonal reservoirs to consumers were awarded to 14 reputed and experienced local contractors of the Department. Works for distribution of water supply were taken up from 1980 onwards on a piecemeal basis depending on availability of fund. The pattern of existing water distribution in the project area is from the zonal tank to the supply tank (GI Tank) and from the supply tank to consumers through lengthy service lines mostly of GI pipes. A bunch of as many as 50 service lines takes off from a single supply tank. The service lines are 15 mm GI are laid over ground and usually inside the drain.

Table 6-12: Recommended Land requirement based on Capacities

SNo.	Identified Capacities	Land requirement (Hectares)
1	5 MLD	0.10
2	10 MLD	0.19
3	50 MLD	0.93
4	100 MLD	1.87
5	200 MLD	3.73
6	500 MLD	9.34

#### 6.1.2.4 PROPOSALS

There are ample amount of overhead water tanks in Shillong Municipal Area and Census Towns. Some of the villages have one or more than one overhead water tanks. The villages in the northern and north eastern periphery of the planning area are unserved

According to the population forecast for the year 2041, the number of water tanks has to be determined as shown in *Table 6-13*. Considering the consumption of water per person per day is 70lpcd.

**Table 6-13: Water Tank provisioning Standard**

Population	Capacity of water tanks (LPD)	No. of water tanks
<500	30,000	1
500- 1000	30,000	2
1000--3000	50,000	4
3000-5000	50,000	6

For setting up of overhead water tanks meeting the goals of AMRUT are mandatory which are as follows:

- The benchmark for per capita water supply should be 70 lpcd.
- Every household should have water connection by 2041.
- PHED will take over the task of identifying water sources, setting up tanks and providing water connection to every household with the help of the local headmen.
- Strategies for Rain Water Harvesting should be employed at household and community level.
- Alternative Source: River Umkhen is an augmented source for further expansion of Shillong planning area and nearby Villages. Rivers such as Wah Umsiang, Wah Lumngi, and Wah Umngot can also be used alongside with it.

#### 6.1.3 SEWERAGE SYSTEM

From primary survey in Shillong Planning Area is 100% Open defecation free. The Shillong Planning Area has no sewerage system. The domestic wastewater, comprising of sewage and sullage, is in general disposed of in the following manner; the sewage flows into individual septic tanks and soaks pits. The sullage from the kitchen and bathroom flows into the primary, secondary and natural drains and finally to the nearby rivers Wah Umkhrah in the north and Wah Umshyrpi in the south.

The amount of sewage generated per person per day is considered as 80% of the total water consumed i.e., 70 lpcd. Therefore, the total waste that will be generated in the future planning years are mentioned below in *Table 6-14*.



To avoid the seepage of sewage from soak pits into the ground water and to find a more efficient and sustainable system of Decentralized Waste Water Management has been proposed.

Table 6-14: Projected Waste Generation

Villages/ Towns	Waste generated 2021 (MLPD)	Waste Generated 2031 (MLPD)	Waste Generated 2041 (MLPD)
Shillong Cantonment Board	0.76	0.86	0.97
Shillong Municipal Area	8.79	9.57	10.35
Census Towns	13.54	15.91	18.28
54 Villages	4.66	5.59	6.52

### 6.1.3.1 DECENTRALISED WASTEWATER MANAGEMENT (DWWM)

This is an approach with a combination of different systems to provide wastewater treatment services to residents on site using aerobic and anaerobic techniques.

Initial step in the planning for DWWMS is the site selection. The potential sites are identified based on:

- Population density, land availability,
- Topography,
- Reuse Potential,
- Existing streams for discharge of treated wastewater if required.
- A reconnaissance survey should be conducted for possible locations for DWWM.

These possible locations should confirm to the overall sanitation plan for the city / town, and should not overlap with those areas where a centralized system already exists or in the offing. Ranking of sites from the preliminary list, for implementing the DWWM, is based on assigning weight ages to certain criteria. Following criteria, along with the corresponding ranks, can be used. Selection of specific sites from the preliminary list, suitable for the implementation of DWWM, is based upon the overall ranking for the site. Environmental sensitivity should also be considered while selecting the sites. Stakeholders' participation is very essential for selecting the sites. For the chosen sites, detailed investigations should be carried out with respect to

- Population,
- Topography,
- Wastewater quantity and quality,
- Details of existing on-site treatment systems,
- Reuse potential, and
- Presence of any drainage channel

### 6.1.3.2 DECENTRALIZED WASTEWATER TREATMENT SYSTEMS (DEWATS)

Usually centralized sewage treatment systems are designed for 30 years. This design period is not suitable for decentralized wastewater treatment systems. Such a large design period will lead to over design of the treatment system and under performance. Hence, it is advisable to have a design period of 15 years. If this is not possible, other way to design a DWWM is to estimate the present day capacity and plan the system for an additional 20% capacity.

### 6.1.3.3 COMPONENTS OF DWWM

Like the centralized wastewater management systems, DWWMs also have

- Wastewater collection system,
- Treatment system, and
- Reuse / disposal systems.

### 6.1.3.4 WASTEWATER COLLECTION SYSTEM

Wastewater collection system for the DWWMs can be designed as

- Micro scale conventional centralized system,
- settled sewage system,
- Small bore sewer system,
- Shallow sewer system,
- Twin drain system and
- Incremental sewerage system.

Micro scale conventional sewerage system may be adopted in locations where there is no underground drainage (UGD) system and either an on-site system is non-existent or improperly designed / functioning and the ability of the user population to financially sustain the O&M costs. During the design, enough provisions should be given for reducing the operation and maintenance problems.

The capacity of each DEWAT is 15,000 lpcd. Therefore, one DEWAT can serve a population of 268 persons per day. Based on the population, the number of DEWATS should be constructed in every locality and villages as a community development programme. The suitable locations for the DEWATS have been identified.

### 6.1.3.5 FAECAL SLUDGE AND SEPTAGE MANAGEMENT (FSSM)

Faecal sludge (Septage) is the slurry that contains both solid and liquid waste that accumulates in Onsite Sanitation Systems (OSS) e.g. septic tanks. It is raw or partially digested slurry that results from the collection, storage or treatment of combinations of excreta and black water, with or without greywater. This has three main components – scum, effluent and sludge. It has an offensive odour, appearance and contains significant levels of grease, grit, hair, debris and pathogenic microorganisms. In the current scenario, the construction and management of OSS are left largely to ineffective local practices and there is lack of holistic septage management practices.

Faecal sludge (septage) management involves collection, treatment and proper disposal/reuse. Efficient faecal sludge (septage) management include safe disposal of the treated septage.

#### 6.1.3.5.1 ADVANTAGES OF FSSM

- Conveyance of waste through cesspool emptier vehicles.
- Treatment of black water in non-sewered areas.
- Per capita waste generation of only ~70 L per annum of faecal sludge vs 39,420 L per annum of sewage.
- Less area requirement for treatment facility.

In Addition to providence of DEWATS and unavailability of Land, Installation of Septage treatment plans. Treated sewage to be discharged into downstream side of nalla or to be used for gardening.



Figure 6-8: Advantages of FSSM

## 6.1.4 POWER

### 6.1.4.1 EXISTING POWER SITUATION

Lack of proper power development planning has led to a power deficit in the region. Recently there is an initiative of the government to tap the power potential of up to 400MW from small hydropower generation. However, potential of about 3000 MW needs to be mobilized at the earliest. The existing power station capacity is 21.5 MW latest by 2017 whereas the total availability of power is 2059.064 mu as per MePGCL (2017). Power will further be transmitted to various sector substations (33/11 kV).

Considering maximum capacity of each such substation as 20 MVA, 17 such sub-stations are existing in the current planning area as shown in *Table 6-15*.

**Table 6-15: Location of Existing Electric Sub-stations**

SNo.	Location of substation	Capacity
1	4th Furlong	33/11 kV
2	Kench's Trace	33/11 kV
3	Laitkor	33/11 kV
4	Lapalang	33/11 kV
5	Lumshyiap	33/11 kV
6	Mawlai Nongkwar	33/11 kV
7	Mawlai Umshing	33/11 kV
8	Mawlynrei	250 kVA
9	Mawprem	33/11 kV
10	Meter factory	33/11 kV
11	Nongmynsong	33/11 kV
12	Nongrah Nongpdeng	250 kVA
13	Nongshilliong	33/11 KV
14	Nongthymmai	33/11 KV
15	SE Falls	33/11 KV
16	Umpling Dongshaneng	250 kVA
17	Umjarain	33/11 KV

### 6.1.4.2 POWER DEMAND & REQUIREMENT OF SUB STATIONS

According to the National Electricity Policy issued in 2005, the recommended power consumption is 1000 units per capita per year or 2.74 kWh per capita per day demand, which includes domestic, commercial, industrial, and other requirements. Also, as

per URDPFI Guidelines, provision of one electric substation of 11KV for population 15000 can be considered as general standard for electricity distribution.

**Table 6-16: Power Consumption Demand and Required Electric Sub-stations for Projected Population in SPA (Zone Wise)**

Zone	Projected Population			Power Consumption Demand (kWh)		Population Served per unit	Required Electric Sub-station	
	2021	2031	2041	2031	2041		2031	2041
A	170852	186544	202237	511130.56	554128.01	15000	12	13
B	275593	324639	373685	889510.86	1023896.90	15000	22	25
C	49589	59507	69424	163047.81	190222.45	15000	4	5
<b>Total</b>	<b>496033</b>	<b>570690</b>	<b>645346</b>	<b>1563689.23</b>	<b>1768247.36</b>		<b>38</b>	<b>43</b>

As per URDPFI Guidelines, following the demand gap assessment, 26 substations are required in and around the Shillong Planning area. The zone wise requirement can be referred from the *Table 6 –16*.

#### 6.1.4.3 PROPOSALS AND RECOMMENDATIONS

Following steps are recommended for improvement in Transmission & Distribution of Power Supply in the long term, short term as well as in present condition.

- Power at 33kV to be taken using overhead transmission line.
- Power at 11kV shall also be taken using overhead transmission line or through underground cables depending upon the condition/necessity/importance and town development planning.
- To ensure minimum interruption of Power Supply, 11kV underground distribution system can be connected in Ring Main. It will ensure alternate source of power supply for all substations connected to the Ring Main.
- Proposed to take LT power supply using underground cables in the town area. It will ease the distribution of Power Supply in the densely populated area of the town.
- Wherever it is necessary to use overhead transmission (Outside city limit), LT Arial Bunch cables can be used to check power theft.
- 11/0.433kV substations can be indoor or outdoor type.
- Whenever there is any space constraint in congested areas, modern compact packaged outdoor substations can be used. This type of modern outdoor substation contains transformer, RMU, capacitor and all the switchgear arrangement in a single compartment. Space required for this substation is 5m x 5m x 4m.
- The main receiving stations should have the SCADA (Supervisory Control & Data Acquisition) facility to ensure on line monitoring & control of power supply. All substations & distribution stations will be interconnected with controlling stations by using modern methods e.g. Fiber optics, Radio communication shall be used for voice communication.

## 6.1.5 SOLID WASTE MANAGEMENT

### 6.1.5.1 EXISTING SOLID WASTE MANAGEMENT STATUS

Solid waste management is a term that is used to refer to the process of collecting and treating solid wastes. It also offers solutions for recycling item that do not belong to garbage or trash. The waste collection and disposal system for Shillong Planning Area is probably a reflection of the existing state of affairs in other urban areas of the State. Until recent times, locality garbage bins were the only mechanism through which household and commercial waste were accumulated, to be subsequently collected and disposed-off by the municipality. At present, a system of 'source' collection household wastes from different localities through a battery of dumpsters is in operation. The commercial wastes, however, are still accumulated in the garbage bins, and much of it stays littered or is considerably dispersed, often clogging major storm drains and natural streams. Further, at source segregation of the wastes into recyclables, organics and hazardous wastes, as is mandatory in many developed countries, is not undertaken. The only disposal facility available for the city is at Marten. Even today, when sanitary landfills are an essential norm, the marten site is just an open area demarcated for disposal of the waste. The location of the site itself is unscientific, as it forms the North Western aspect of the hill draining directly into the Umiam reservoir. As the site is an open dumpsite, without compaction and layering of the accumulated daily waste, nor the inclusion of an impervious lining for containment of leachate, a considerable amount of solid waste and leachate find their way downstream into the Umiam reservoir through the natural agency like wind and water.

### 6.1.5.2 WASTE GENERATION

Solid waste generation is the common basis for activity data to estimate emissions from solid waste disposal, biological treatment, and incineration and open burning of waste. Solid waste generation rates and composition vary from country to country depending on the economic situation, industrial structure, waste management regulations and lifestyle. The solid waste generated in GSPA is 196 metric ton per day (MTD) with waste generation rate at 373 grams per capita per day in Shillong Urban Agglomeration (SUA) area and 274 grams per capita in the areas outside SUA but falling under GSPA. The major solid waste generation sources are households (56%), markets (23%), hotels & restaurants (7%), construction waste (2%), and street sweeping (7%).

Present Problems:

- To dump 100 MTS of Urban waste daily, the Corporation needs 1 Hectare of land every year.
- Open dumping pollutes air and sub-soil water heavily.
- The dumping grounds become breeding centres for mosquitoes and other disease-carrying vectors.

- Municipal workers and rag pickers have to work in unhygienic conditions.
- The waste undergoes anaerobic composting producing offensive odour and fostering harmful pathogens.

### 6.1.5.3 NORMS FOR SOLID WASTE MANAGEMENT (URDPFI)

#### 6.1.5.3.1 SOLID WASTE REQUIREMENT FOR TOWNSHIP

Clean and Safe Environment is one of the prime objective requirements for the township the rapid growth in population and urbanization overburden the solid waste management in the Planning Area.

According to MSW Rules 2000 MSW includes commercial and residential wastes generated in a municipal or notified areas in either solid or semisolid form excluding industrial hazardous wastes but including treated bio-medical wastes. Waste generation encompasses activities in which materials are identified as no longer being of value (being in the present form) and are thrown either away or gathered for disposal. The waste generation per capita per day for estimation and forecast of waste generation as shown in *Tables 6-17 and 6-18*.

Table 6-17: Waste Generation Per Capita per Day

SNo	Land use Type	Estimated Waste Generation
1	Residential refuse	0.3 to 0.6 kg/cap/day
2	Commercial refuse	0.1 to 0.2 kg/cap/day
3	Street sweepings	0.05 to 0.2 kg/cap/day
4	Institutional refuse	0.05 to 0.2 kg/cap/day

Source: Manual on Solid Waste Management, CPHEEO – 2000

#### 6.1.5.4 PROJECTED SOLID WASTE MANGAMNET

Table 6-18: Projected SWM - 2041

Population 2041	Land use Type	percentage of land use	Estimated Waste (kg/cap/day)	Generated Waste (kg/day)
645346	Residential/Mixed/Rural/Slum	48.00%	0.6	387207.6
	Commercial	4.00%	0.15	3872.08
	Street	10.00%	0.2	12906.92
	Institutional	13.00%	0.1	8389.5
<b>Total waste (Metric Tonne per day)</b>				<b>412.38</b>

#### 6.1.5.5 PROPOSED LANDFILL AREA

A landfill is a location where waste materials are disposed of. The purpose is to prevent waste from coming into contact with the environment, particularly with nearby rivers and streams that provide most communities' drinkable water. The required landfill area is computed based on the projected waste generation by 2041. The calculations are carried

out in line with the standards specified in the Municipal Solid Waste Management Manual, CPHEEO, as shown in *Table 6-19*.

**Table 6-19: Calculation for Landfill capacity, Landfill Height & Landfill Area**

Particulars	Quantity	Units
Current Waste Generation	196.00	TPD
Estimated Waste Generation in 2041	412.38	TPD
Considering 50% reduction after treatment	206.19	TPD
<b>Total waste generation in 20 years</b>	<b>1354836.08</b>	<b>Tones</b>
Total waste volume (assumed density @ 0.85 tones/m <sup>3</sup> )	1593924.8	m <sup>3</sup>
Total volume of daily cover (on the basis of 15 cm soil cover on top and sides for lift height of 1.5 to 2 m)	159392.48	m <sup>3</sup>
Total volume required for components of liner system and of cover system (on the assumption of 1.5m thick liner system (including leachate collection layer) and 1.0 m thick cover system (including gas collection layer)	199240.6	m <sup>3</sup>
Volume likely to become available within 10 years due to settlement / biodegradation of waste	159392.48	m <sup>3</sup>
<b>First estimate of landfill capacity</b>	<b>1793165.40</b>	<b>m<sup>3</sup></b>
Possible Maximum Landfill Height	20	m
Area required for land filling separations	8.97	Ha
<b>Total area required (including infrastructural facilities) (first estimate)</b>	<b>10.31</b>	<b>Ha</b>

#### 6.1.5.6 LIFE SPAN ESTIMATION OF LANDFILL AREA

The location of a landfill in any environment is a critical element that must be taken into account due to numerous factors such as the landfill's lifespan, site selection, design, construction, operation, and management. As a result, it is critical to precisely estimate the landfill's lifespan in order to manage the scarce resource and make plans for its future use.

In order to estimate the lifespan of the landfill, the future value of money equation was applied (Equation 1)

$$y_n = W_t \times (1 + G)^{t_n - t_0} \dots\dots\dots(1)$$

Where  $y_n$  is the yearly throughput of MSW received at the landfill in tons per for a specific activity in any given year,  $W_t$  is the waste quantity 2021,  $G$  is the decadal growth rate,  $t_n$  is the previous yearly throughput and  $t_0$  is the initial yearly throughput. The  $G$  was estimated using Equation 2.

$$G = \frac{t_n - t_0}{t_0} \times 100\% \dots\dots\dots(2)$$

The lifespan estimation results obtained is shown in *Table 6-20*.



Table 6-20: Lifespan Estimation of Landfill

Year	Waste Generated Yearly (tons/year)	Decadal Growth Rate (%)	Total consumed capacity (tons)	Total consumed capacity (m3)	Total Remaining Capacity (m3)
2021	60225		60225	170537.9	1793165.40
2031	70895	0.18	131120	371290.4	1421874.98
2041	81565	0.15	152461	431719.5	990155.43
2051	92236	0.13	173801	492148.7	498006.76
2061	102906	0.12	195141	552577.8	<b>-54571.04</b>

The yearly throughput in *Table 6-19* is the amount of MSW created and received at the landfill in tones per year, which is occasionally converted into cubic meters. The total consumed capacity is the quantity of waste that the landfill is receiving within its lifetime. The total remaining capacity represents the total quantity of waste in cubic meters that the landfill is able to accept for disposal during it lifetime. The remaining lifetime of the landfill at 2051 is estimated to be 498006.76 m<sup>3</sup> (*Table 6-20*) and by the year 2061, the landfill will not be able to sustain the waste generated. Hence, the Landfill site or sites of 10.3 Ha (*Table 6-19*) shall sustain till the plan period of 2041 and further till 2051.

#### 6.1.5.7 CRITERIA FOR PROPOSING LANDFILL

Landfill site shall be 100 meter away from river, 200 meter from a pond, 200 meter from Highways, Habitations, Public Parks and water supply wells and 20 km away from Airports or Airbase. However, in a special case, landfill site may be set up within a distance of 10 and 20 km away from the Airport/Airbase after obtaining no objection certificate from the civil aviation authority/ Air force as the case may be. The Landfill site shall not be permitted within the flood plains as recorded for the last 100 years, zone of coastal regulation, wetland, Critical habitat areas, and sensitive eco-fragile areas.

Table 6-21: Landfill Area Requirement

Waste Quantity (Tonnes per Design life of landfill)		Requires Site Area (Ha)
<i>In Million</i>	<i>In Lakhs</i>	
<1.0	<10	15-20
1.0-2.0	10-20	20-30
2.0-3.0	20-30	30-40
>3.0	>30	>40

Source: Expert Committee for Revision of MSWM manual (2013-15)

Eight landfill sites have been identified subject to availability of land and acceptance by the local community and have been proposed considering the waste generation of Shillong Planning Area. As already stated around **412.38 metric tonnes per day** of Waste generation

is anticipated by 2041, the landfill sites have been identified considering the life cycle of 25-30 years for the planning area and based on suitability analysis (*Table 6-22*).

**Table 6-22: Location and No of Landfill Sites**

Location	No of Landfill Sites
Nongkohlew	1
Madan Saisiej	1
Mawkynring	4
Umroh	1
Mawiong	1
<b>Total</b>	<b>8</b>

#### 6.1.5.8 PROPOSALS

- Sustainable and efficient waste segregation- Household level waste segregation should be implemented strictly, where wastewater is segregated as recyclable and non-recyclable waste.
- Incentives for Recycling- Policies should be implemented for providing incentives for recycling waste. Such policies have started in many countries. These incentives will nudge the public to be more efficient with their waste generation and disposal.
- Decentralised Waste Recovery Centres shall be taken up which promote composting of organic waste and scraping of resubless at the community/ locality level with only inerts being sent to the landfill. Thus will greatly reduce the amount of waste being sent to the landfill. Therafter, on the sucess of the pilot project, this shall be extended into parts of the planning area wherever land is available and where community engagement is positive.
- Potential sites for landfills- At present there is one landfill site serving the whole city. A number of potential landfill site have been identified to cater to the needs of the future population growth and waste generation by the respective stakeholders. In view of the various constraints, particularly objections from the local inhabitants for sitting up of landfill site, it is recommended that potential sites can be identified beyond the planning area, whereas the facility may also serve the purpose of regional landfill for neaby towns in other districts.

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA

LOCATION FOR PROPOSED LANDFILL SITE

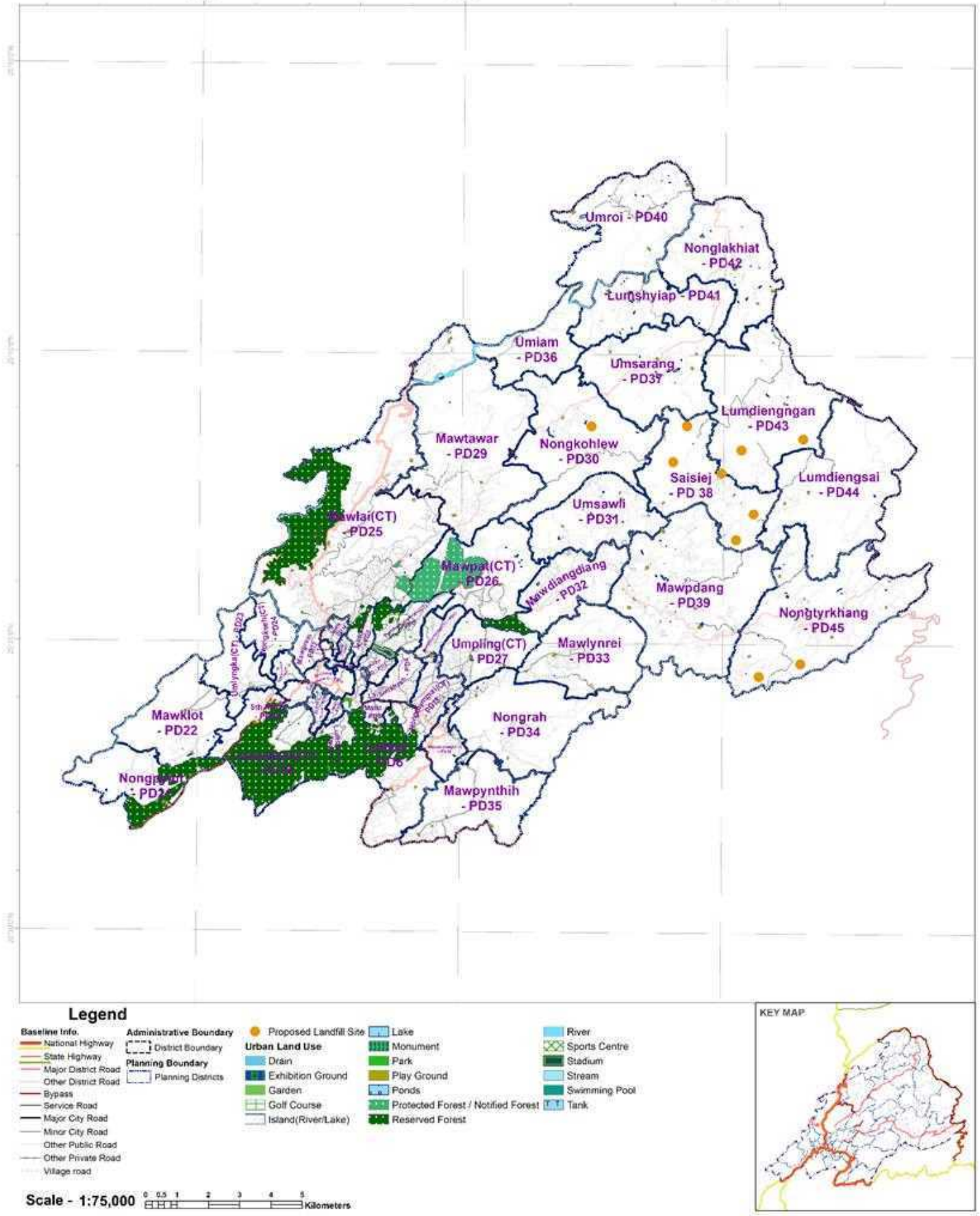


Figure 6-9: Location for Proposed Landfill site



## 6.2 SOCIAL INFRASTRUCTURE

Social infrastructure is a subfield of the urban infrastructure domain that mainly includes assets that embrace social services. Social infrastructure plays an important role in developing strong and inclusive communities. It can provide opportunities to bring different groups of people together, contributing to social integration and the desirability of a place. The loss of social infrastructure can have a detrimental effect on a community. It includes various facilities that support social services. These are; Educational, Healthcare, Sports, Recreational, Socio-cultural, Distributional, Police safety facilities.

India is drastically different in terms of how its labour laws are regulated, how its citizens are educated and how their health is handled. The social infrastructure of India is quite different from other countries as population is comparatively very high. Therefore, criteria for planning of various amenities will also be different. The basic concentration for planning provision of social infrastructure India must be education and healthcare facilities. India continues to make good progress in increasing incomes and improving living standards over the past decades.

Social infrastructure of developed countries is different. In spite of having proper infrastructure they keep on developing or improving their infrastructure. As the population with respect to area covered is not very high, they can develop new facilities without destroying current ones.

### 6.2.1 EDUCATION

As per census 2011, Shillong Planning Area has a literacy rate of around 90.06%. The educational facilities in Shillong Planning Area are diverse in nature. The existing facilities include medical college, arts, commerce and science, law, engineering etc. There are number of government as well as private institutes. Shillong being a city prominent has its own importance for imparting practical education in the NER (North Eastern Region), which could be seen in the existing higher education facilities that are present in and around the city.

As per 2011 census, SPA has the following educational facilities within the Planning Area limits: There are at present 412 primary schools and 137 secondary and higher secondary schools including degree colleges with Classes XI and XII catering to a population of around 3.5 lakh. To provide primary, secondary and higher secondary school facilities to all school students, the following standards has to be followed as per *Table 6-23*. There are at present 32 Higher Education Institutions, besides North Eastern Hills University, Martin Luther University, ICFAI University, IGNOU, William Carey University and CMJ University. In addition, there is one Polytechnics in Shillong Planning Area.

Table 6-23: Norms and Standards for Educational Facilities

SNo	Educational facility	Population/unit Served	Distance between two facilities (km)	Area range (ha)
1	Primary School	4,000	0.5 to 1	0.20 to 0.30
2	Senior Secondary School	1,500	1 to 3	0.30 to 0.50
3	Industrial training Centre	-	3 to 4	0.30 to 0.50
4	College	30,000	3 to 4	2.00 to 3.00
5	Professional College	30,000	3 to 4	1.00 to 1.50
6	University	50,000	3 to 4	2.00 to 3.00

Source: URDPFI 2015

The future requirements of the education facilities in the Shillong Planning Area are detailed in the Table 6-24.

Table 6-24: Demand Gap Assessment for Educational Institutions

SNo	Educational facility	Existing Number	Additional Number 2021	Additional Number 2031	Additional Number 2041	Total Requirement
1	Primary School	412	-	-	8	8
2	Senior Secondary School	137	-	-	-	-
3	Industrial training Centre	1	-	-	-	1
4	College	32	-	-	-	-
5	Professional College	9	7	2	2	11
6	University	6	-	-	-	-

The table estimates that eight more Primary Schools will be required by 2041, while no additional Senior Secondary Schools or Colleges are deemed necessary. One Industrial Training Centre is required presently. However, two more Professional Colleges are required in 2031, and 2 more in 2041, bringing the total to 11. There are no additional requirements mentioned for Universities. Overall, the total additional facilities required sum up to 8 Primary Schools and 11 Professional Colleges.

### 6.2.1.1 PROPOSED EDUCATIONAL FACILITIES

There are 142 Primary schools existing in the planning area, and as per norms 8, more Primary schools 0.30 hectares each land has been located. Potential locations for setting up Educational Institutions have been identified in Shillong Planning Area. These locations can be used to set up schools, colleges, universities and vocational centers (Table 6-24).

## 6.2.2 HEALTH

### 6.2.3 EXISTING FACILITIES

Health can be defined as a state of complete physical, mental and social wellbeing and not merely the absence of illness or infirmity. Good health contributes to a full life. The main objective is to attain the same for the total population of the Shillong Planning Area (Table 6-25).

Table 6-25: Health Facilities in Shillong Planning Area

SNo	Healthcare facility	Number	Number of Beds
1	Government Hospital	6	1370
2	Private Hospitals	9	1400
3	Multispecialty Hospitals	3	84
4	Specialty hospital	5	25
5	Nursing home	2	-
6	Intermediate Hospital (Category B) (80 beds) (PHC)	10	-
7	Intermediate Hospital (Category B) (80 beds) (HSC)	4	-
8	Diagnostic centre	21	-
9	Polyclinic	4	-

#### 6.2.3.1 GOVERNMENT SCHEMES

##### 6.2.3.1.1 NATIONAL HEALTH POLICY

National Health Policy is to create optimal conditions for maximizing the potential of each person's health throughout their lives and to achieve adequate standards of quality of life.

The main objectives of the National Health Policy are to increase the chances of survival at birth and to increase employment expectancy. To ensure quality of life and reduce health differences for all social groups. Strengthening partnerships to promote health; development of stewardship by people for their own health.

The specific objectives of the National Health Policy is to ensure economic and social security of the population, health promotion and disease prevention. Providing a good start in life and maintaining a healthy younger generation. Improving the health of seniors through the control of non-communicable chronic diseases. To create a healthy and safe environment, proper nutrition and physical activity, and to create a society free from tobacco, alcohol and drugs. Provide the conditions for improved mental health and a successful health system.

### 6.2.3.2 PROPOSALS

The proposed health facilities consist of dispensaries at neighborhood level and nursing homes, polyclinics, intermediate hospitals (Category A & B), Multi-specialty hospitals, Specialty hospitals, Family Welfare Centers and dispensaries for pet animals and birds.

Table 6-26: Demand Gap Assessment for future provision of Health Infrastructure

Health facility	Population/ unit Served	No of Beds	Plot Size Area range (ha)	Existing	Additional Number in		
					2021	2031	2041
Dispensary/ Clinic	15000	-	0.08 to 0.12	22	11	4	4
Nursing home, (25-30 beds)child welfare and maternity center	45000-100000	25 to 30 beds	0.20 to 0.30	2	2	1	1
Polyclinic	100000	-	0.20 to 0.30	4	1	1	1
Intermediate Hospital (Category B) (80 beds) (PHC)	100000	80 beds Initially maybe for 50 beds including 20 maternity beds	1.00	10	-	-	-
Intermediate Hospital (Category A)(200 beds) (HSC)	100000	200 beds Initially the provision maybe for 100 beds	3.70	4	1	1	1
Multi-Specialty Hospital (NBC)	100000	200 beds Initially the provision may be for 100 beds	9.00	3	1	-	-
Specialty Hospital (NBC)	100000	200 beds Initially the provision may be for 100 beds	3.70	5	-	1	1
General Hospital (NBC)	250000	500 Initially the provision maybe for 300 beds	6.00	7	-	-	-
Family Welfare Centre	50000	-	500 - 800 sqm	-	9	1	1
Diagnostic center	50000	-	500 - 800 sqm	21	-	-	-
Dispensary for pet animals and birds	100000	-	-	1	-	-	-

Source: In line with URDPFI 2015

The population/unit served ranges from 15,000 to 250,000, while the plot size area ranges from 0.08 to 9.00 hectares. The number of beds varies depending on the type of health facility, ranging from no beds for Dispensary/ Clinic to 500 beds for General Hospital (NBC).

Some of the health facilities also have categories, such as Intermediate Hospital (Category B) and Intermediate Hospital (Category A) (Table 6-26).

## 6.2.4 SOCIO-CULTURAL

Socio-cultural facilities are an important component for the development of a City. As per the survey, presently there are 30 Anganwadi, 277 Religious Facility, 83 community halls, 9 Music, dance and drama centre, 5 Meditation and spiritual Centre, 4 Orphanage/ Children's Centre, 2 Care centre for physically mentally challenged people 68 Working women – men hostel, 1 Night Shelter, 2 Socio – Cultural centre/ Exhibition cum fair ground and 1 Science Centre (Table 6-27).

Table 6-27: Demand Gap Assessment for Socio-Cultural Facilities

Socio-Cultural Facility	Population/unit Served	Plot Size Area range (ha)	Existing	Additional Number		
				2021	2031	2041
Anganwadi - Housing area/ cluster	5000	200-300 sqm	30	69	14	14
Community Room	5000	750 sqm (NBC)	-	-	-	-
Religious Facility	5000	400 sqm	277	-	-	-
Community hall, mangal karyayala, barat ghar/ library	15000	2000 sqm	83	-	-	-
Music, dance and drama centre	100000	1000 sqm	9	-	-	-
Meditation and spiritual Centre	100000	5000 sqm	5	-	-	-
Old age home	500000	1000 sqm	1	-	-	-
Religious Facilities at sub city level	100000	4.00 Ha	-	-	-	-
Orphanage/ Children's Centre	1000000	1000 sqm	4	-	-	-
Care centre for physically mentally challenged	1000000	1000 sqm	2	-	-	-
Working women – men hostel	100000	1000 sqm	68	-	-	-
Adult education centre	1000000	1000 sqm	-	-	-	-
Night Shelter	1000000	1000 sqm	1	-	-	-
Socio – Cultural centre/ Exhibition cum fair ground	1000000	15 Ha (NBC)	2	-	-	-
Science Centre	1000000	-	1	-	-	-

Source: In line with URDPFI 2015

The population/unit served ranges from 5,000 to 1,000,000, while the plot size area ranges from 200-300 sqm for Anganwadi - Housing area/cluster to 15 hectares for Socio – Cultural centre/ Exhibition cum fairground (NBC). The existing numbers of facilities vary depending



on the type of facility, ranging from 30 for Anganwadi - Housing area/cluster to 277 for Religious Facility.

#### 6.2.4.1 PROPOSED SPORT FACILITIES

As per the ULU, it appears that every community in adjoining regions has one playground. The sport facility is self-sustained, in case of any further development the following norms and standards shall be in *Table 6-28*.

Table 6-28: Norms and Standards for Future requirements of Sports Areas

SNo	Sports facility	Population/unit Served	Existing	Area range (ha)
1	Residential unit play area	5,000	-	5000 sqm
2	Neighbourhood Play area	15,000	174	1.50 ha
3	District Sports Centre	100000	1	8.00 ha
4	Divisional Sports Centre	1000000	-	20.00 ha

Source: URDPFI 2015

#### 6.2.4.2 POLICE AND SECURITY

Based on existing availability and projected population, an analysis was done to determine how many additional police stations and outposts would be needed by 2041. There are sufficient police stations to cover the full planning area, but eight further police stations are needed by 2041 (*Table 6-26*).

Table 6-29: Demand Gap Assessment for future provision for Police and Security

SNo	Facilities	Population/unit Served	Area range (ha)	Existing	Additional Number		
					2021	2031	2041
1	Police Post	40000	5000 sqm	3	6	1	1
2	Police Station	90000	1.50	7	-	-	-
3	District office and battalion	1000000	8.00	1	-	-	-
4	Police line	2000000	20.00	-	-	-	-
5	District Jail	1000000	-	2	-	-	-
6	Civil Defence and home guards	1000000	-	1	-	-	-
7	Police Training Institute/ College	City Level	-	1	-	-	-
8	Police Firing Range	City Level	-	-	-	-	-

Source: In line with URDPFI 2015

### 6.2.4.3 FIRE SAFETY

As per URDPFI guidelines (Table 6-5) one substation is required to be provided within 3-4 km radius. One fire station is required to be provided per two lakh population or 5 to 7 km radius. Fire stations should be located so that the fire tenders are able to reach any disaster site within 3-5 minutes. One Fire station is provided in Shillong city, which is almost centrally located in Fire Bridge, Malki.

Table 6-30: Demand Gap Assessment for future provision for Fire Safety

SNo	Facilities	Population/unit Served	Area range (ha)	Existing	Additional Number		
					2021	2031	2041
1	Fire Station	200000	12	6	-	-	-
2	Disaster Management Centre	One in each administrative zone	1	1	-	-	-
3	Fire Training Institute/ College	City level	3	-	1	-	-

Source: In line with URDPFI 2015

## 7 TRAFFIC AND TRANSPORTATION

### 7.1 SURVEY BACKGROUND AND OBJECTIVES

Shillong city faces heavy traffic congestion during peak hours because of high influx of vehicles from the surrounding areas. NESAC conducted Cordon Point Survey, Turning Movement Survey, Origin-Destination Survey and Parking Survey to collect and collate the data of travel behaviour patterns and characteristics throughout the planning area.

The main objectives of these traffic surveys are:

- To get the data about total influx and out flux of traffic for the city.
- To get the characteristics of traffic flow and Level of service of the roads.
- To get the characteristics of on street and off-street parking.

#### 7.1.1 CORDON LINE SURVEY

The imaginary line representing the boundary of the study area is termed as Cordon line and the survey done inside the area covered by cordon line to study travel pattern to large extent is known as Cordon line survey.

##### 7.1.1.1 PURPOSE OF THE CORDON POINT SURVEY

- To appreciate the traffic characteristics.
- To appreciate the desired patterns of passenger and goods traffic.
- To assess the intensity of through and destined traffic.
- To use in model validation.

##### 7.1.1.2 COVERAGE

Five on-road stations in the surrounding area of Shillong City.

##### 7.1.1.3 METHOD OF SURVEY

Manual classified volume count from 7am to 7pm.

#### 7.1.2 TURNING MOVEMENT SURVEY

Turning Movement Count or most popularly known as Intersection count is to count pedestrians, cycles or vehicles, which are moving towards an intersection.

Turning Movement Count (TMC) used to determine the left turn, right turn or U-turn of fast-moving vehicles.

### 7.1.2.1 PURPOSE OF THE TURNING MOVEMENT SURVEY

- Used in making decisions regarding the geometric design of the roadway,
- Sign and signal installation, Signal timing,
- Pavement marking,
- Traffic circulation patterns,
- Capacity analysis,
- Parking and loading zones, and vehicle classification.

### 7.1.2.2 COVERAGE

Fifteen junctions in the Shillong Planning Area.

### 7.1.2.3 METHOD OF SURVEY

Manual classified volume count from 7am to 7pm.

## 7.1.3 ORIGIN-DESTINATION SURVEY AT CORDON POINTS

OD survey determines the pattern of journey that people make. It consists of determining:

- Origin of trip.
- Destination of trip.
- Purpose of trip.
- Mode of travel.
- Time of trip.
- Length of trip.
- Other socio-economic data of the trip maker.

### 7.1.3.1 PURPOSES OF THE ORIGIN-DESTINATION SURVEY

- Determining travel demands on existing and future facilities
- Knowing the adequacy of existing parking and other terminals
- Location of new terminals, bridge or by-pass
- Judging the adequacy of mass transportation facilities, planning, and locating the new services.
- Planning, designing, and locating of new facilities or improving the existing system.
- Establishing travel characteristics from various types of land uses.

- Estimating future travel needs, patterns and requirements of transportation facilities.
- Arriving at construction priorities and economic justification of improvements or new ventures.
- Establishing the socio-economic correlations.

#### 7.1.3.2 COVERAGE

Five on-road stations in the surrounding area of Shillong City.

#### 7.1.3.3 METHOD OF SURVEY

Interview at roadside from 7am to 7pm.

#### 7.1.4 PARKING SURVEY

There are many methods of parking survey but here we have used License plate method of survey. Parking surveys, conducted to know the number of parking bays, parking occupancy of the parking area, average turn over, average parking duration.

##### 7.1.4.1 PURPOSE OF THE PARKING SURVEY

- The supply and type of parking facilities, both on street and off-street.
- How and for what purposes parking facilities used including parking duration and illegal parking.
- The demand for parking space.
- The characteristics of parking demand.
- Legal, financial and administrative factors associated with parking situation and the adequacy of the existing enforcement measures.

##### 7.1.4.2 LICENSE PLATE METHOD OF SURVEY

- This survey results in the most accurate and realistic data.
- In this case, of survey, every parking stall is monitored at a continuous interval of 15 minutes or so and the license plate number is noted down.
- This will give the data regarding the duration for which a particular vehicle was using the parking bay.
- This will help in calculating the fare because fare is estimated based on the duration for which the vehicle was parked.
- This method is very labor intensive.

### 7.1.5 CORDON LINE SURVEY

Cordon survey, conducted at five cordon points. These points are as shown in *Figure 7-1*.

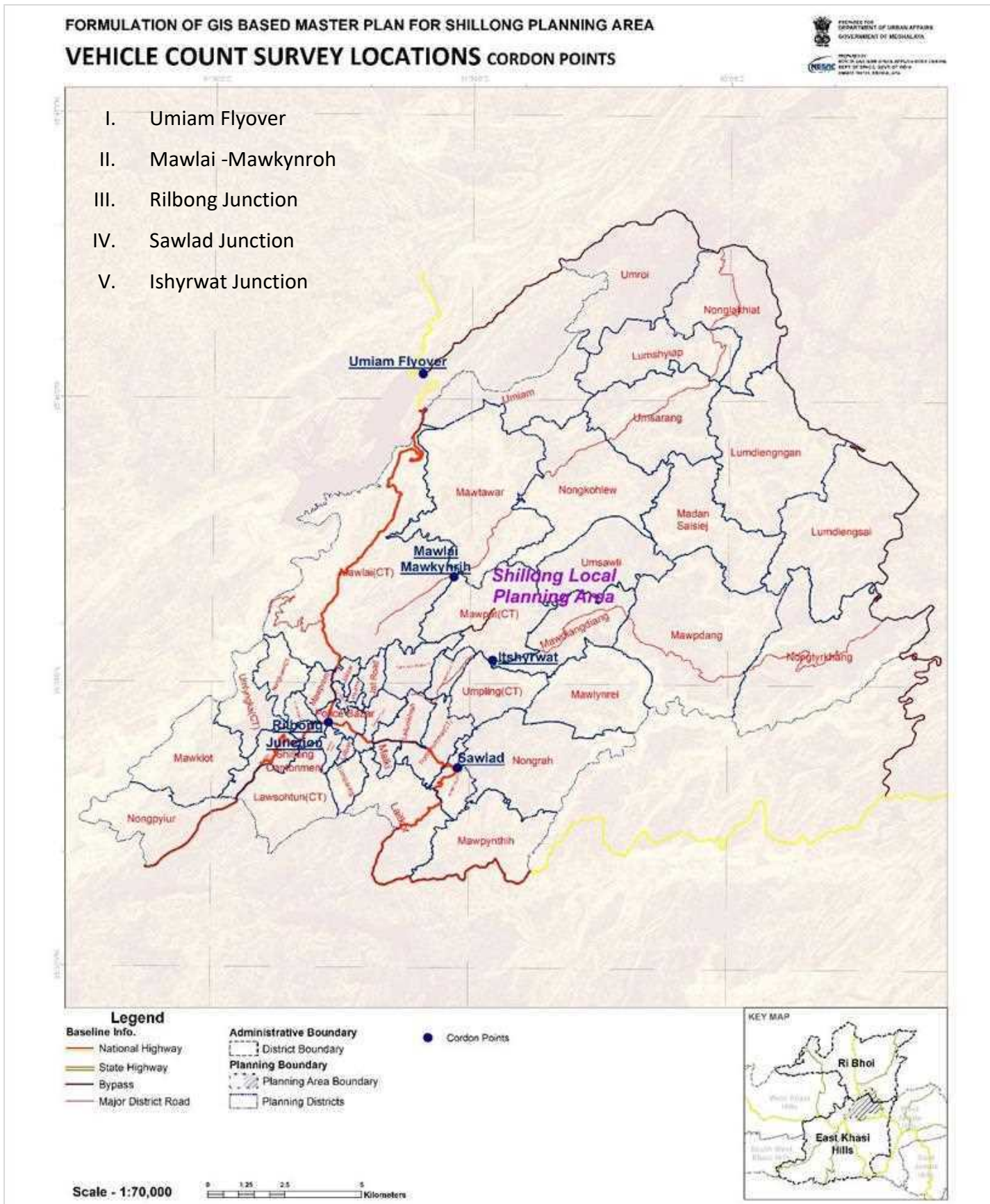


Figure 7-1: Location of Cordon Points

### 7.1.5.1 RESULTS AND ANALYSIS

From the cordon point survey, it have been observed that approximate 40% of PCU enter the city at Rhino point museum and approximately 41% of PCU exit the city at this point. Because of this heavy inflow and outflow of traffic, Rhino point museum observes traffic congestion during most of the hours of the day. Following *Table 7.1* shows the percentage of traffic exiting and entering the city from 7am to 7pm.

Table 7-1: Percentage of traffic exiting and entering at the Cordon Points

Cordon Points	% of traffic exiting the city (PCU)	% of traffic entering the city (PCU)
Rilbong Junction	41	40
Sawlad	25	21
Umiam Flyover	18	16
Ishyrwat	13	17
Mawlai Mawkynroh	4	6

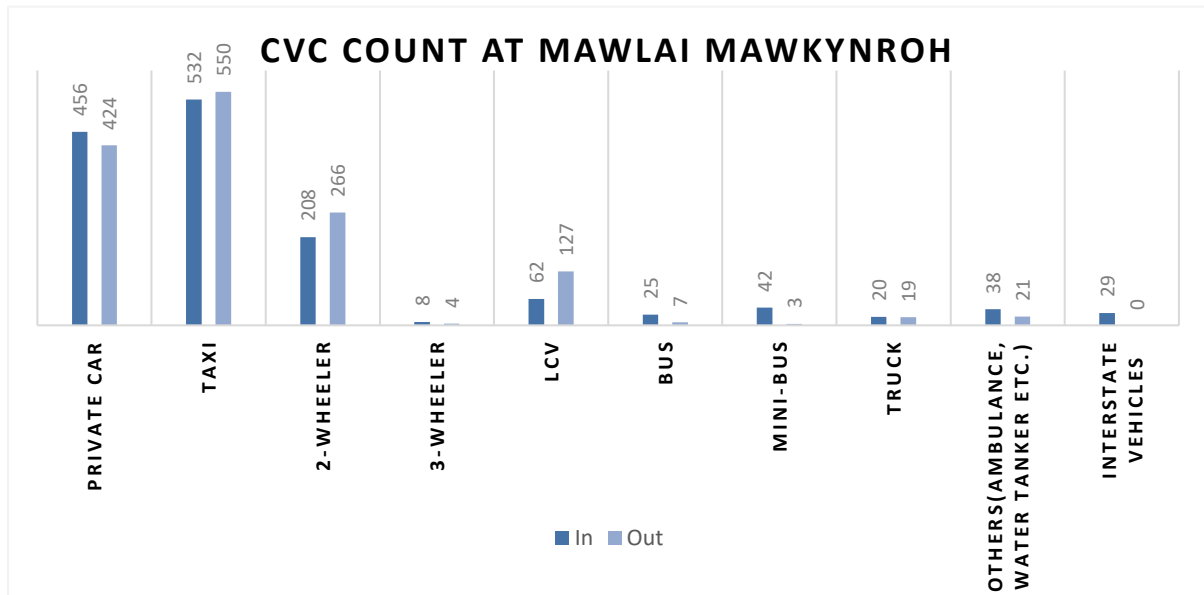


Figure 7-2: CVC Count at Mawlai Mawkynroh

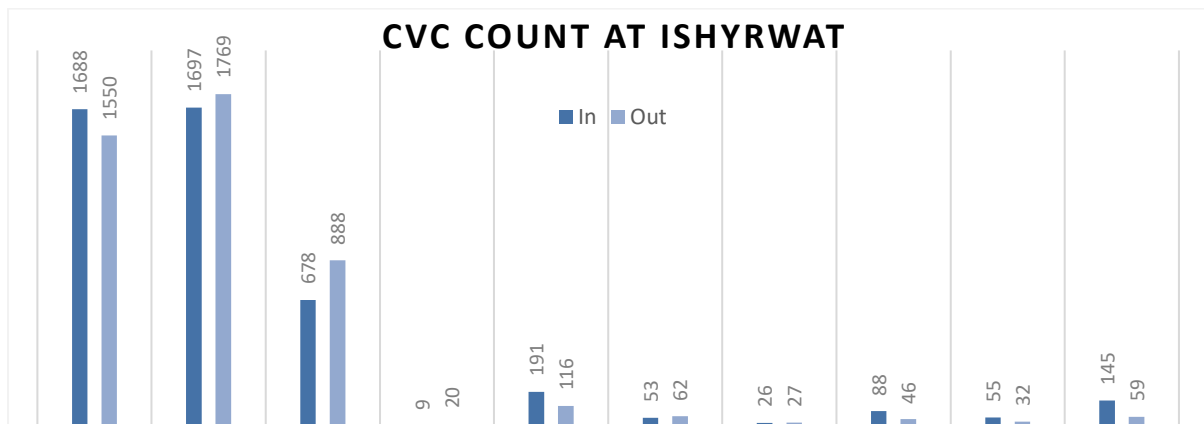


Figure 7-3: CVC Count at Ishyrwat

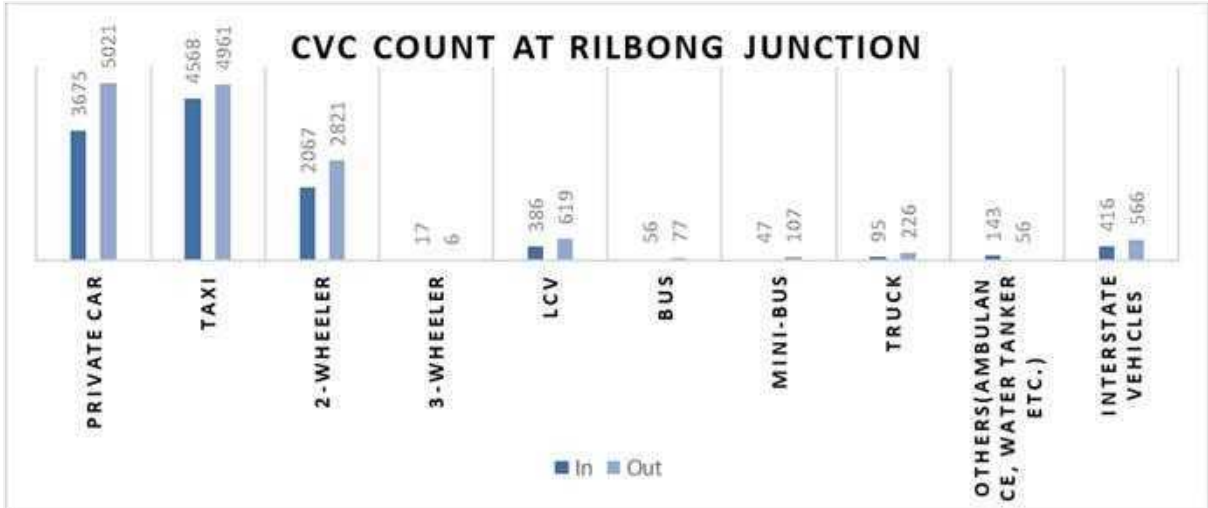


Figure 7-6: CVC Count at Rilbong Junction

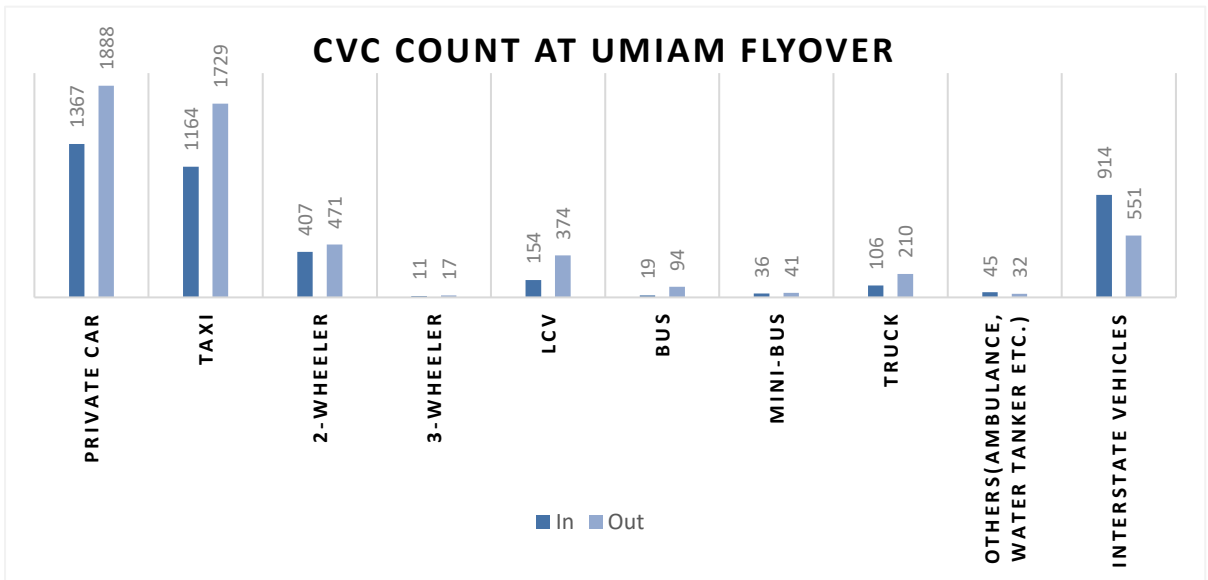


Figure 7-5: CVC count at Umiam flyover

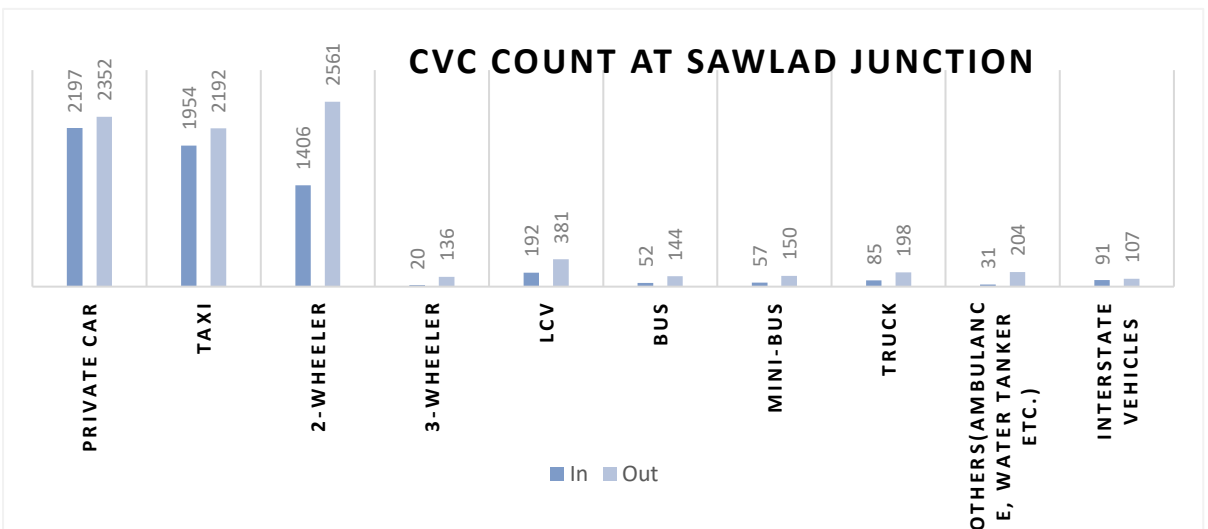


Figure 7-4: CVC Count at Sawlad Junction



The cordon points, peak hour traffic has been observed nearly in the morning between 09-11 AM and in the evening between 05-07 PM. Between these times, heavy traffic congestion is observed in the city (Figure 7-7 and 7-8).

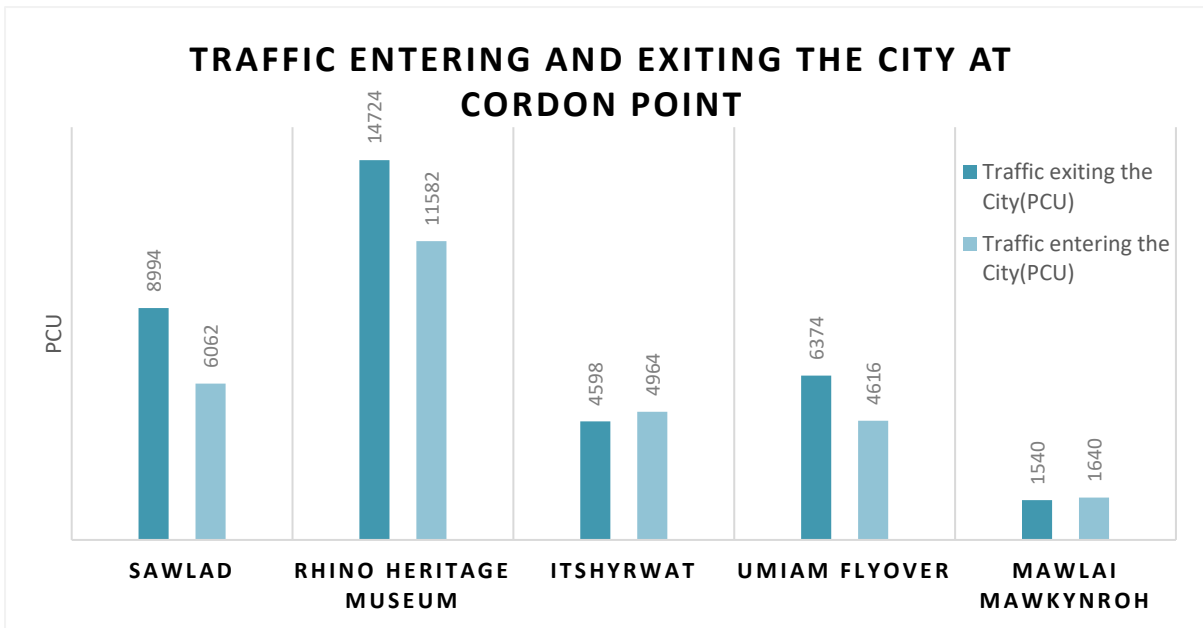


Figure 7-7: Traffic Entering and Exiting the City at Cordon Point

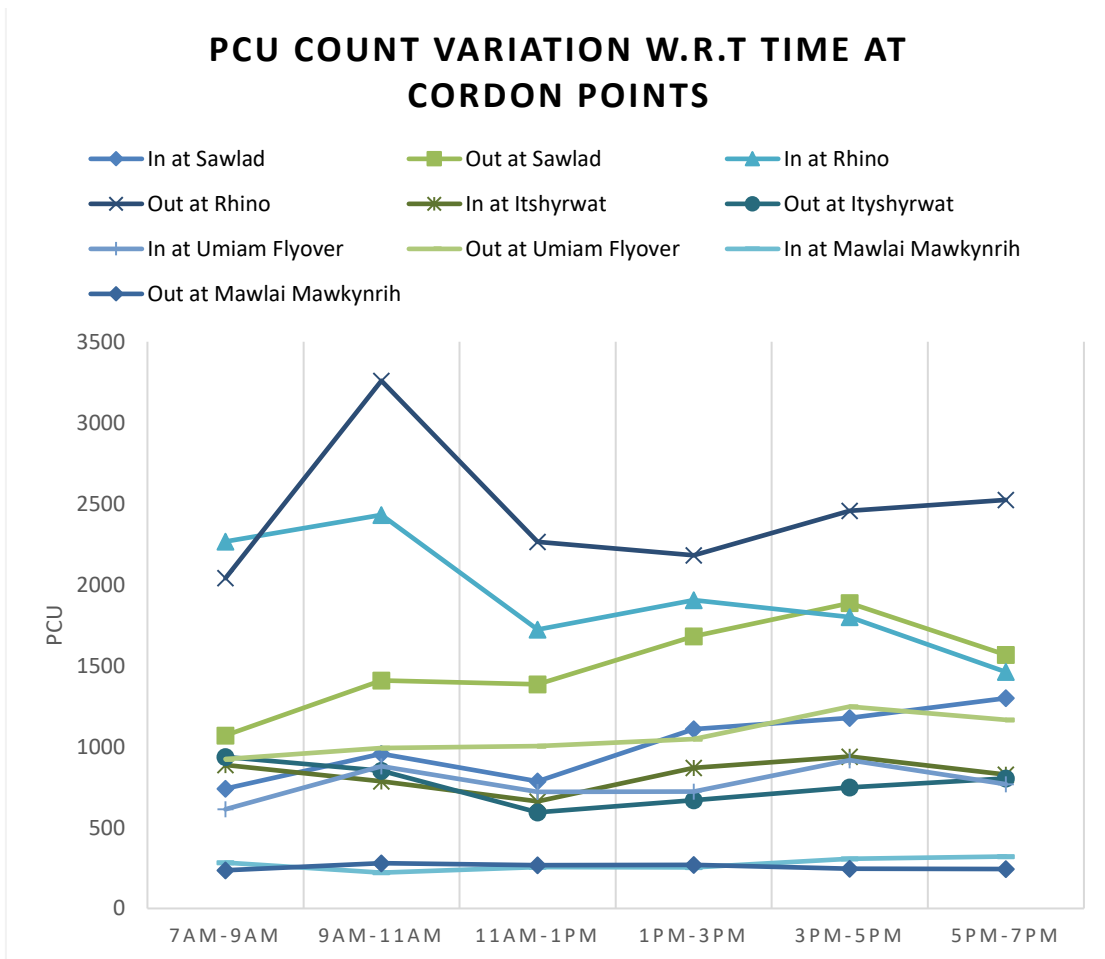


Figure 7-8: PCU Count Variation w.r.t Time at Cordon Points

## 7.1.6 TURNING MOVEMENT SURVEY

The survey was conducted at important junctions to know the existing movement of traffic at the junctions i.e. left turning, right turning and U-turning traffic. The timing of this survey was from 7 AM to 7 PM taking 2 hours interval for analysis. This survey has been done by well-trained professionals using classified volume count method i.e. individual vehicle has been noted down in separate categories of vehicle classes and finally these counts have been converted into the equivalent Passenger Count Units (PCU). This data, used to design the traffic junction geometry and other physical features, traffic signal timings, etc.

### 7.1.6.1 RESULTS AND ANALYSIS

#### 7.1.6.1.1 NAME OF THE JUNCTION- UMIAM FLYOVER JUNCTION

Umiam flyover junction is the entry point in the Shillong from Guwahati side. At the junction, 'Guwahati to Shillong' and 'Shillong to Guwahati' directions have percentage traffic shares 23.57% and 29.33% respectively (*Table 7-2*). These two directions are the main traffic movement directions.

Peak hour traffic flows for the main directions 'from Shillong to Guwahati' and 'from Guwahati to Shillong' have been observed at the junction between 3-5PM (*Figure 7-9*).

Level of service (LOS) calculation at the junction shows that the V/C ratio for direction 'junction to Guwahati' is one i.e. equivalent to LOS of E. Other two directions 'junctions to Shillong' and 'junction to Umroi' have V/C ratios of 0.72 and 0.56 which are equivalent to LOS of C and A respectively (*Figure7-10*).

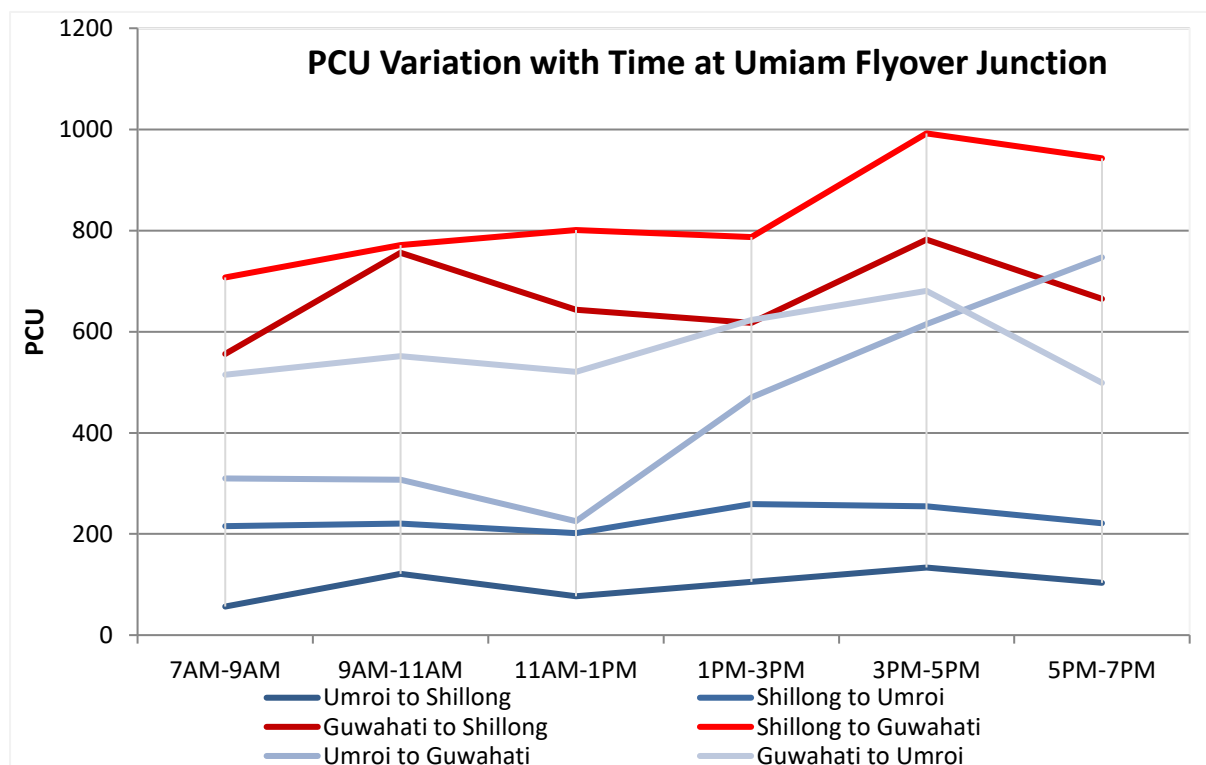


Figure 7-9: PCU Variation at Umiam Flyover Junction

Table 7-2: Observed Peak Volumes and Total PCU at Umiam Flyover Junction

Name of The Road	Observed Peak Volume 2019 (PCU/Hr)	Total PCU 2019 (7am-7pm)
Umroi to Shillong	67	597
Shillong to Umroi	130	1372
Guwahati to Shillong	391	4020
Shillong to Guwahati	496	5002
Umroi to Guwahati (Under the Bridge) and Umroi to Guwahati (Over the Bridge)	374	2674
Guwahati to Umroi	340	3389

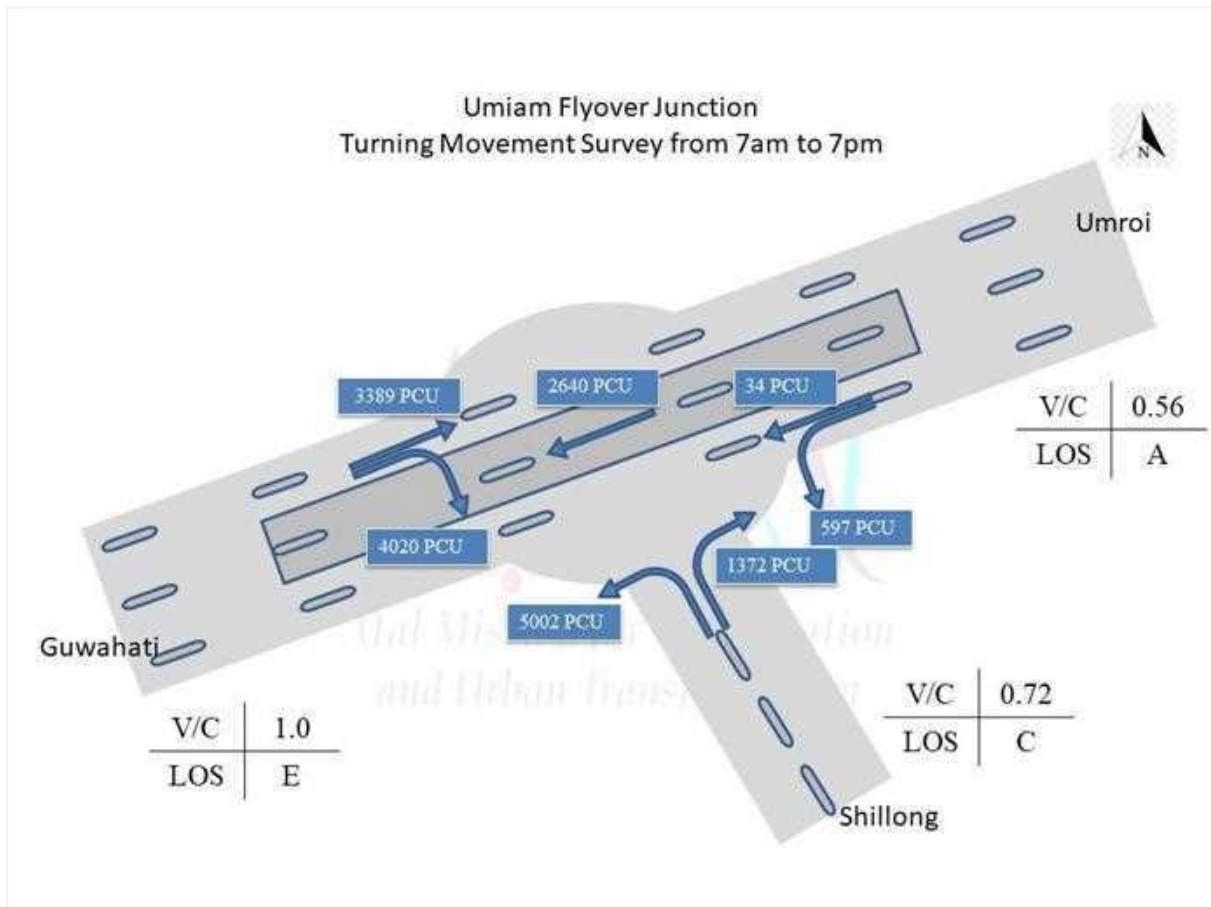


Figure 7-10: LOS and total PCU counts at the Umiam Flyover Junction

### 7.1.6.1.2 NAME OF THE JUNCTION- MAWLAI PETROL PUMP JUNCTION

Mawlai petrol pump junction is one of the congested junctions in the Shillong city. At this junction, 'Guwahati to Shillong' and 'Shillong to Guwahati' directions have percentage traffic shares 31.92% and 23.96% respectively (Table 7-3). These two directions are the main traffic movement directions.

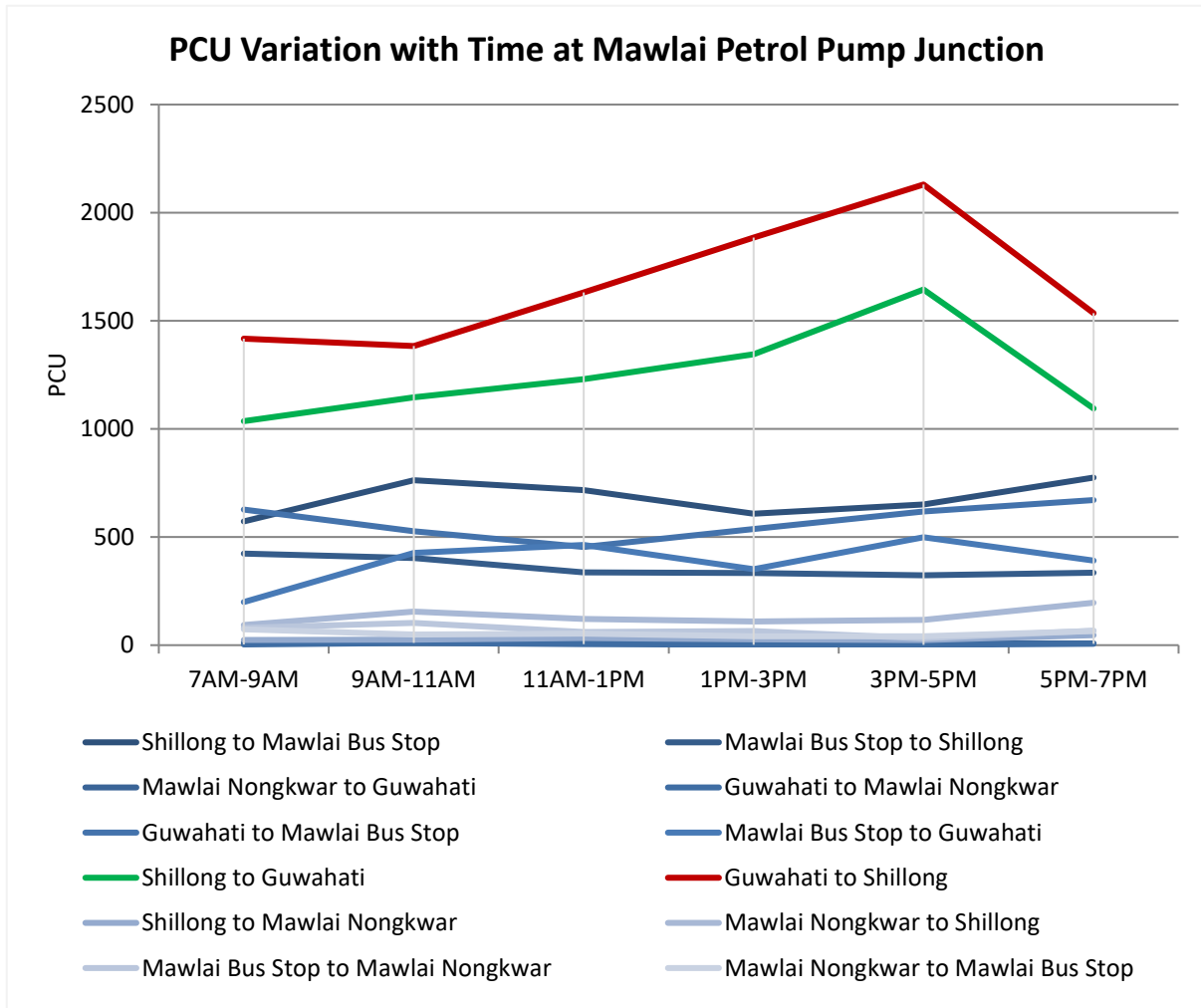


Figure 7-11: PCU Variation with Time at Mawlai Petrol Pump Junction

Table 7-3: Observed Peak Volumes and Total PCU at Mawlai Petrol Pump Junction

Name Of The Road	Observed Peak Volume 2019 (PCU/Hr)	Total PCU 2019 (7am-7pm)
Shillong to Mawlai Bus Stop	388	4085
Mawlai Bus Stop to Shillong	212	2156
Mawlai Nongkwar to Guwahati	7	67
Guwahati to Mawlai Nongkwar	5	28
Guwahati to Mawlai Bus Stop	336	3434
Mawlai Bus Stop to Guwahati	250	2330
Shillong to Guwahati	822	7496
Guwahati to Shillong	1065	9983
Shillong to Mawlai Nongkwar	23	179
Mawlai Nongkwar to Shillong	98	790
Mawlai Bus Stop to Mawlai Nongkwar	51	406
Mawlai Nongkwar to Mawlai Bus Stop	37	324

Peak hour traffic flows for the main directions ‘Guwahati to Shillong’ and ‘Shillong to Guwahati’ have been observed at the junction between 3-5PM (Figure 7-11).

Level of service (LOS) calculation at the junction shows that the V/C ratio for both the directions ‘junction to Guwahati’ and ‘junction to Shillong’ is 1.63 i.e. equivalent to LOS of F. Other direction ‘junction to Mawlai bus stop’ has V/C ratio of 0.96 which is equivalent to LOS of E. Direction ‘junction to Mawlai Nongkwar’ is the minor one (Figure 7-12).

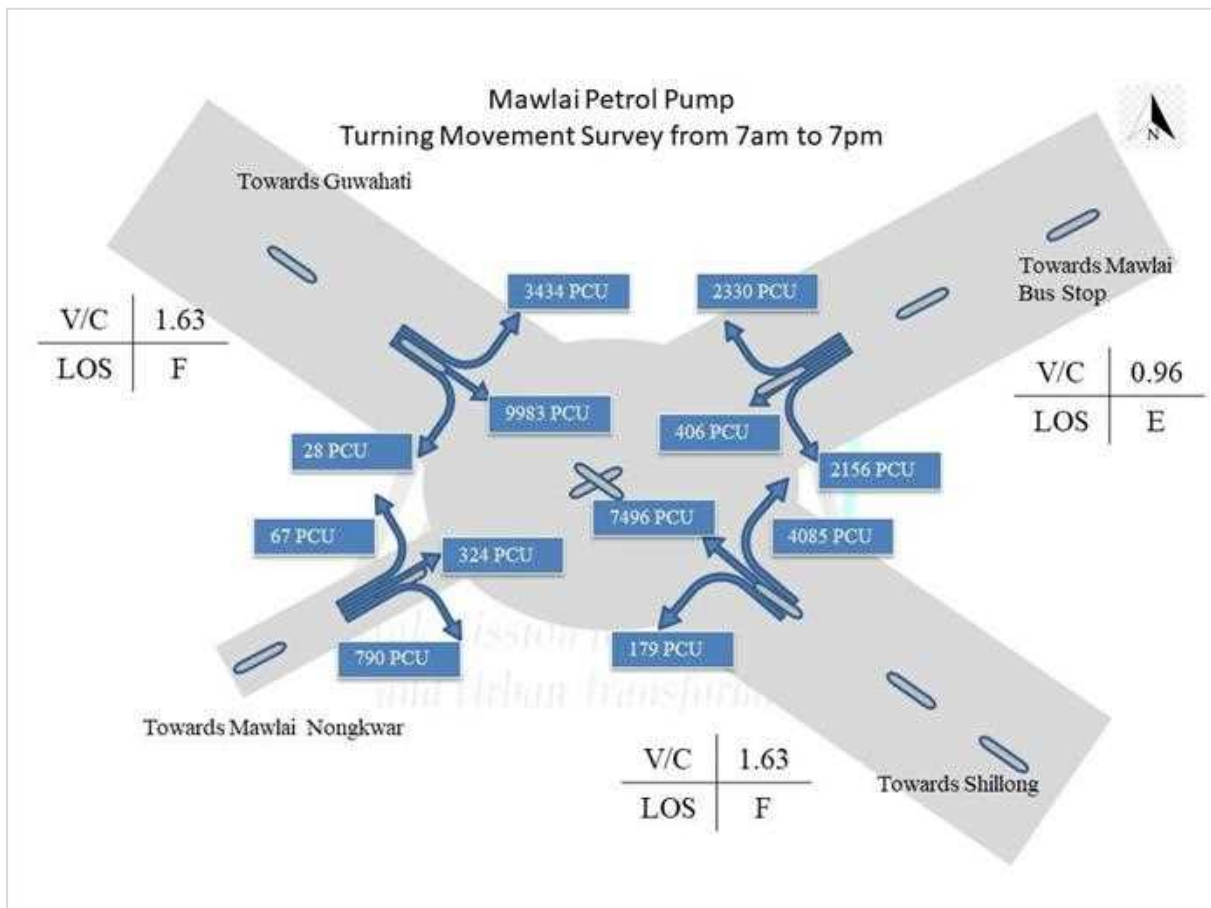


Figure 7-12: LOS and total PCU counts at the Mawlai Petrol Pump Junction

### 7.1.6.1.3 NAME OF THE JUNCTION- KHASI HILLS DISTRICT COUNCIL JUNCTION

Khasi hills district council junction is one of the most congested junctions in the Shillong city. At the junction, traffic congestion occurs because of Garikhana taxi stand and adjoining market area. At the junction, ‘Rhino to Guwahati’, ‘Guwahati to Rhino’ and ‘Mothphran to Guwahati’ directions have percentage traffic shares 22.68%, 28.61% and 27.13% respectively (Table 7-4). These three directions are the main traffic movement directions.

Peak hour traffic flows for the main directions ‘Guwahati to Rhino’ and ‘Mothphran to Guwahati’ have been observed at the junction between 5-7PM while for the main direction ‘Rhino to Guwahati’, peak hour traffic flow has been observed between 9-11AM (Figure 7-13).

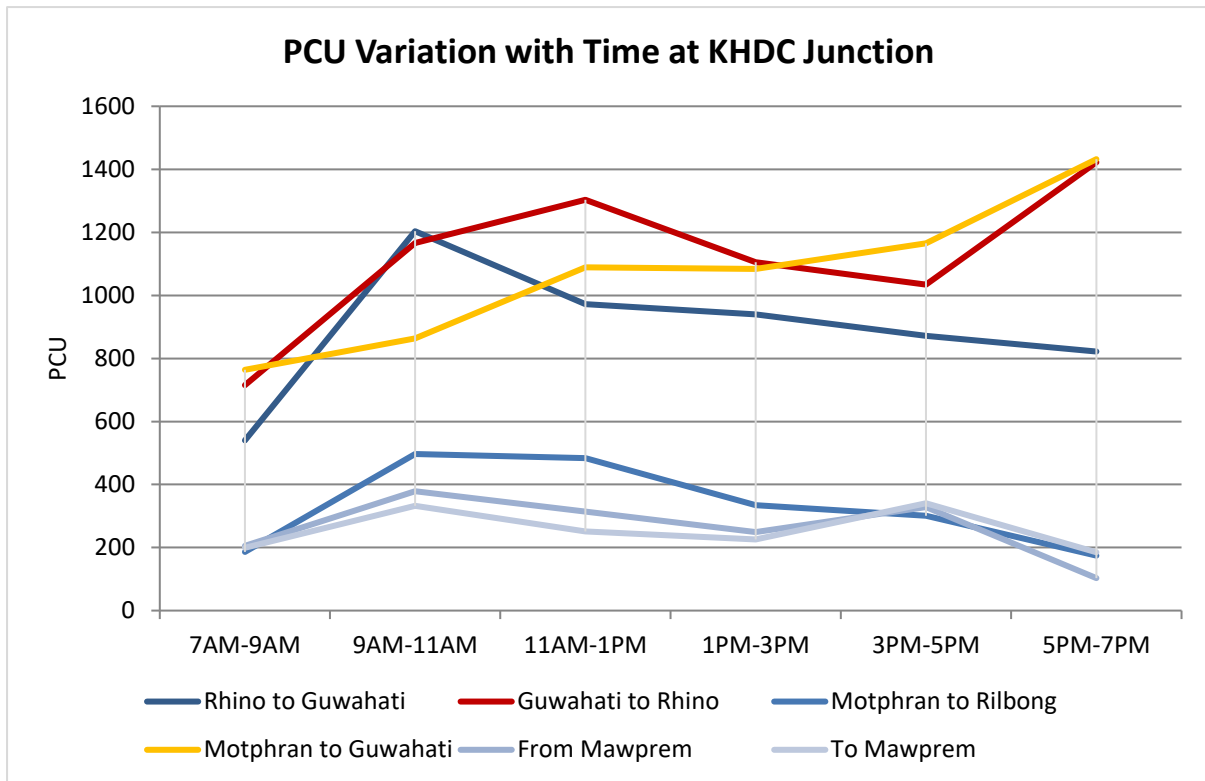


Figure 7-13: PCU Variation with Time at KHDC Junction

Level of service (LOS) calculation at the junction shows that the V/C ratio for the direction ‘junction to Guwahati’ is 1.23 i.e. equivalent to LOS of F while V/C ratio for the direction ‘junction to Rhino’ is 0.96 i.e. equivalent to E. At the junction, ‘Mothphran to junction’ direction is one-way i.e. there is no ‘from junction to Mothphran’ vehicle movement (Figure 7-14).

Table 7-4: Observed Peak Volumes and Total PCU at KHDC Junction

Name Of The Road	Observed Peak Volume 2019 (PCU/Hr)	Total PCU 2019 (7am-7pm)
Rhino to Guwahati	602	5350
Guwahati to Rhino	711	6747
Mothphran to Rilbong(Rhino)	248	1975.6
Mothphran to Guwahati	716	6397
From Mawprem	189	1579.5
To Mawprem	170	1533

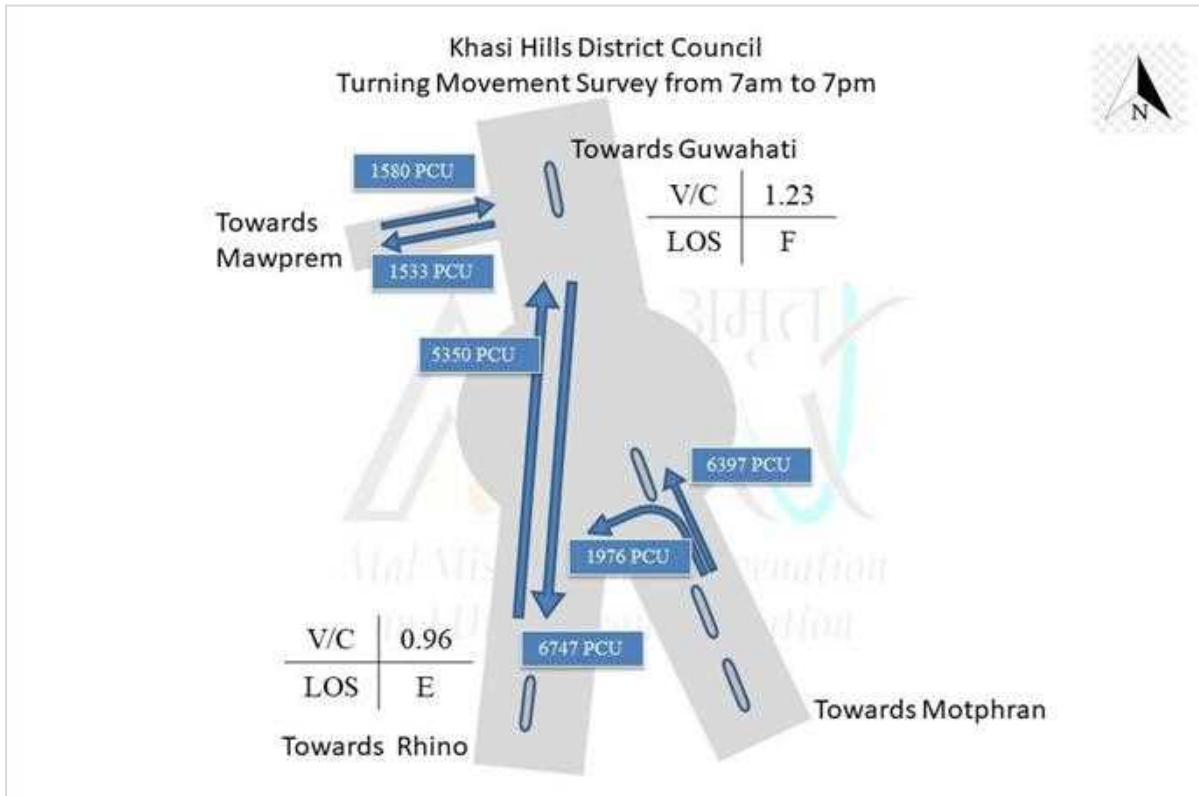


Figure 7-14: LOS and total PCU counts at the KHDC Junction

#### 7.1.6.1.4 NAME OF THE JUNCTION- MAWLAI MAWKYNROH JUNCTION

At this junction, 'NEHU to Mawtarwar' and 'Mawtarwar to NEHU' directions have percentage traffic shares 31.35% and 41.24% respectively (Table 7-5). These two directions are the main traffic movement directions.

Peak hour traffic flows for the main directions 'NEHU to Mawtarwar' and 'Mawtarwar to NEHU' have been observed between 9-11AM and between 5-7PM respectively (Figure 7-15).

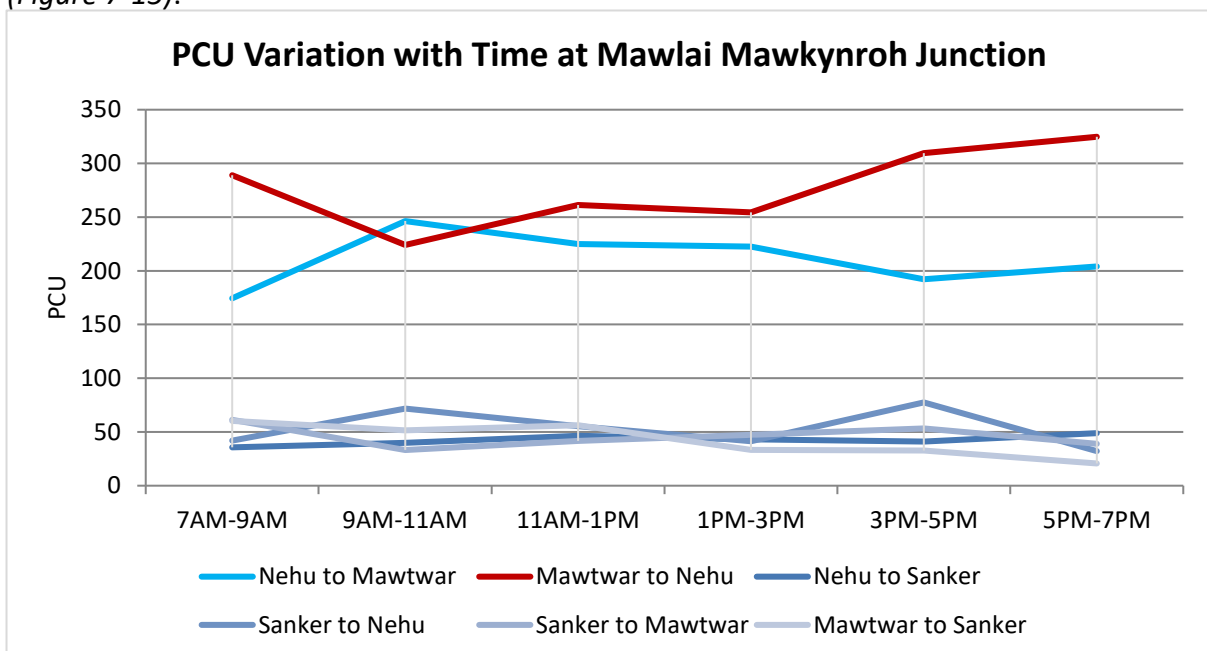


Figure 7-15: PCU Variation with Time at Mawlai Mawkynroh Junction

Table 7-5: Observed Peak Volumes and Total PCU at Mawlai Mawkynroh Junction

Name of The Road	Observed Peak Volume 2019 (PCU/Hr)	Total PCU 2019 (7am-7pm)
NEHU to Mawtawar	123	1265
Mawtawar to NEHU	162	1663
NEHU to Sanker	24	255
Sanker to NEHU	39	320
Sanker to Mawtawar	31	276
Mawtawar to Sanker	30	255

Level of service (LOS) calculation at the junction shows that the V/C ratios for the directions 'junction to NEHU' and 'junction to Mawtawar' are 0.21 and 0.20 respectively, and equivalent LOS for both directions is A (Figure 7-16).

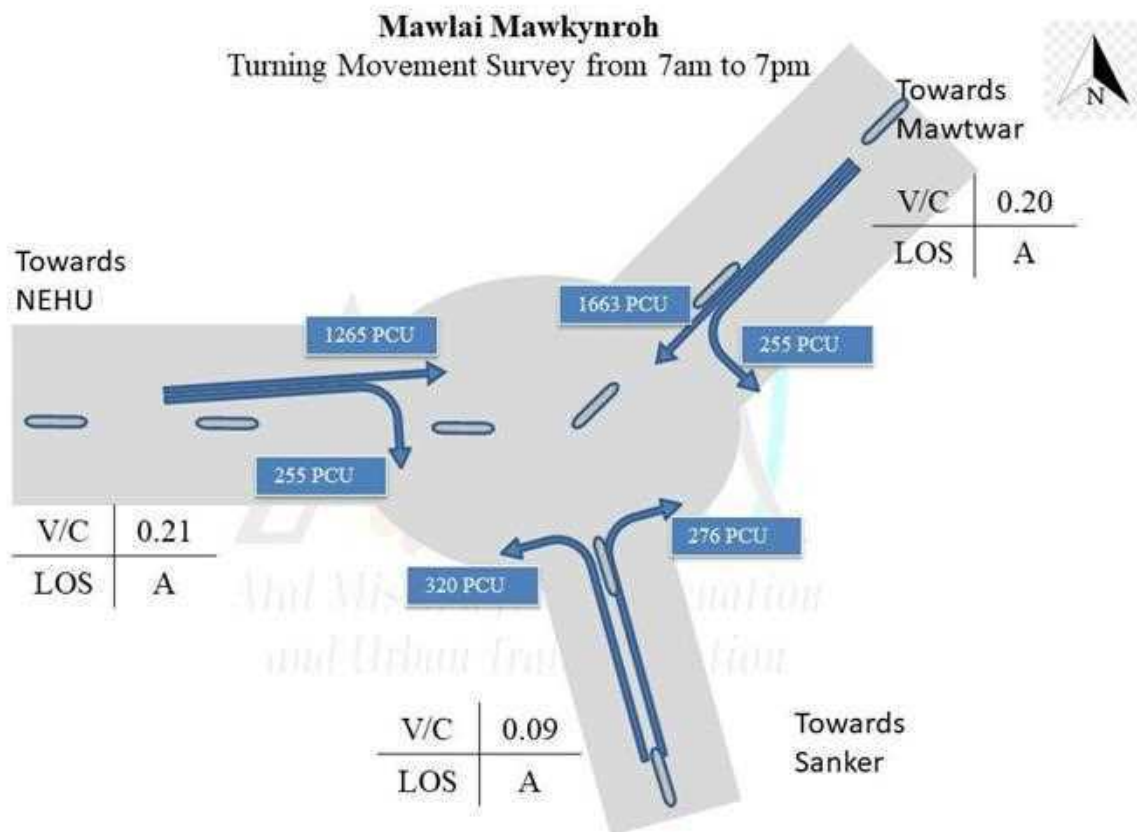


Figure 7-16: LOS and total PCU counts at Mawlai Mawkynroh Junction

#### 7.1.6.1.5 NAME OF THE JUNCTION- SAWLAD JUNCTION

Sawlad junction observes heavy traffic congestion during the evening hours. At this junction, 'Laitkor to Shillong' and 'Shillong to Laitkor' directions have percentage traffic shares of 24.64% and 35.75% respectively (Table 7-6). These two directions are the main traffic movement directions.



Peak hour traffic flows for the main directions ‘Laitkor to Shillong’ and ‘Shillong to Laitkor’ have been observed between 5-7PM and between 3-5 PM respectively (Figure 7-17).

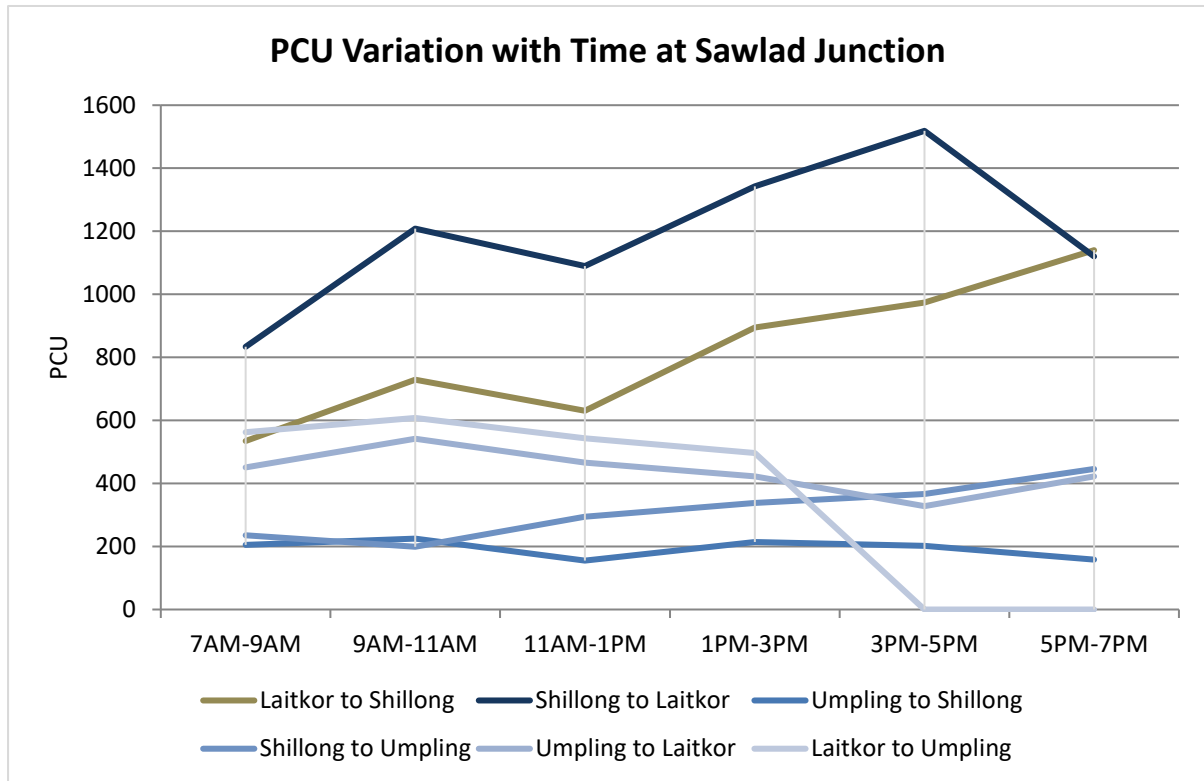


Figure 7-17: PCU Variation with Time at Sawlad Junction

Table 7-6: Observed Peak Volumes and Total PCU at Sawlad Junction

Name Of The Road	Observed Peak Volume 2019 (PCU/Hr)	Total PCU 2019 (7am-7pm)
Laitkor to Shillong	570	4903
Shillong to Laitkor	759	7113
Umpling to Shillong	112	1160
Shillong to Umpling	223	1881
Umpling to Laitkor	271	2631
Laitkor to Umpling	304	2210

Level of service (LOS) calculation at the junction shows that the V/C ratios for directions ‘junction to Shillong’ and ‘junction to Laitkor’ are 1.02 and 1.05 respectively, and equivalent LOS for both the directions is E (Figure 7-18).

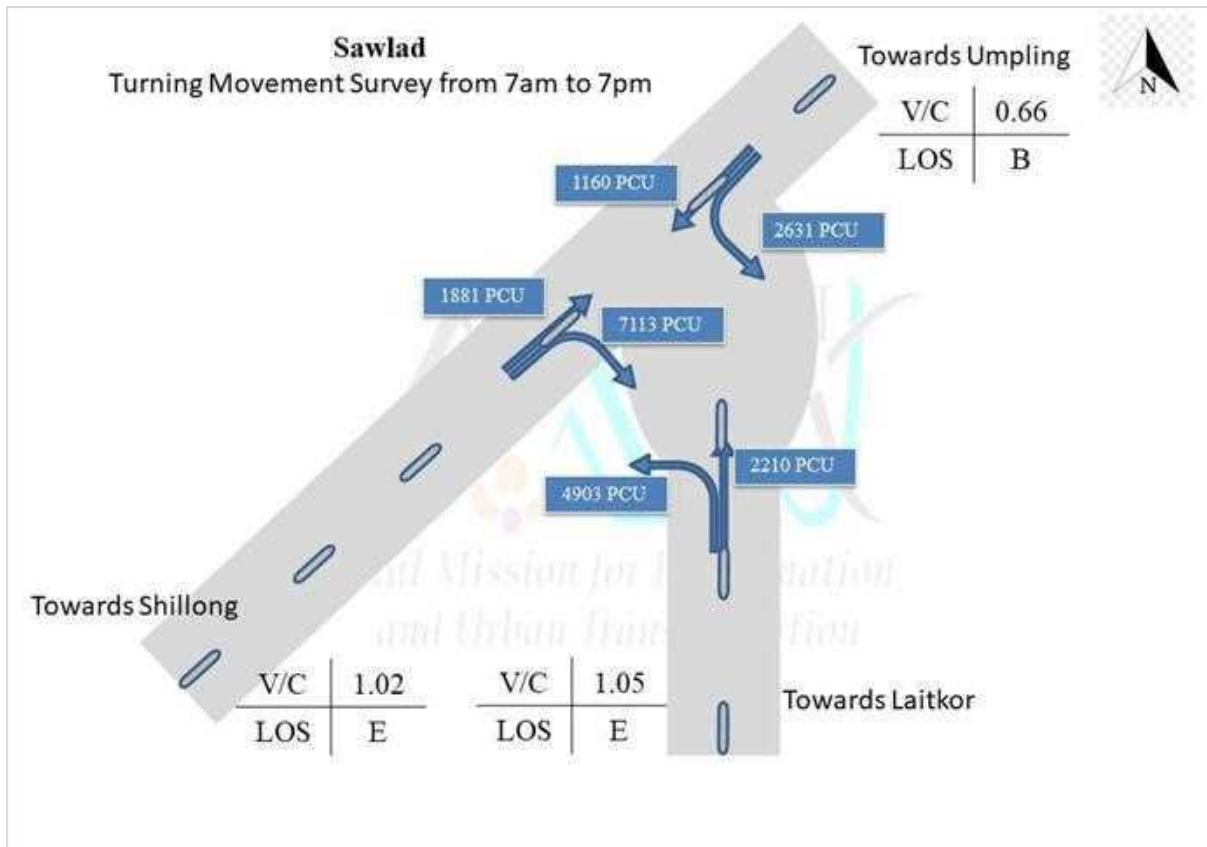


Figure 7-18: LOS and total PCU counts at Sawlad Junction

#### 7.1.6.1.6 NAME OF THE JUNCTION- RILBONG JUNCTION

Rilbong (Rhino heritage) junction is one of the most congested junctions. At this junction, traffic congestion occurs because of heavy cross-traffic flow, parked vehicles waiting for passengers and on-street vendors. Traffic flow at this junction is control by traffic police. At this junction, 'Garikhana to Anjalee pump' and 'Anjalee pump to Garikhana' directions have percentage traffic shares of 23.43% and 21.13% respectively. Directions 'Umshyrpi bridge to Anjalee pump' and 'Anjalee pump to Umshyrpi bridge' have percentage traffic shares of 21.15% and 18.21% respectively. Traffic movement directions 'Umshyrpi bridge to Garikhana' and 'Garikhana to Umshyrpi Bridge' directions share less share of traffic movement than others, which are 9.80% and 6.29% respectively (*Table 7-7*).

Peak hour traffic flows for the directions 'Garikhana to Anjalee pump' and 'Anjalee pump to Garikhana' have been observed between 7-9AM and 9-11AM respectively. Peak hour traffic flows for the directions 'Anjalee pump to Umshyrpi Bridge' and 'Umshyrpi Bridge to Anjalee pump' have been observed between 9-11AM (*Figure 7-19*).

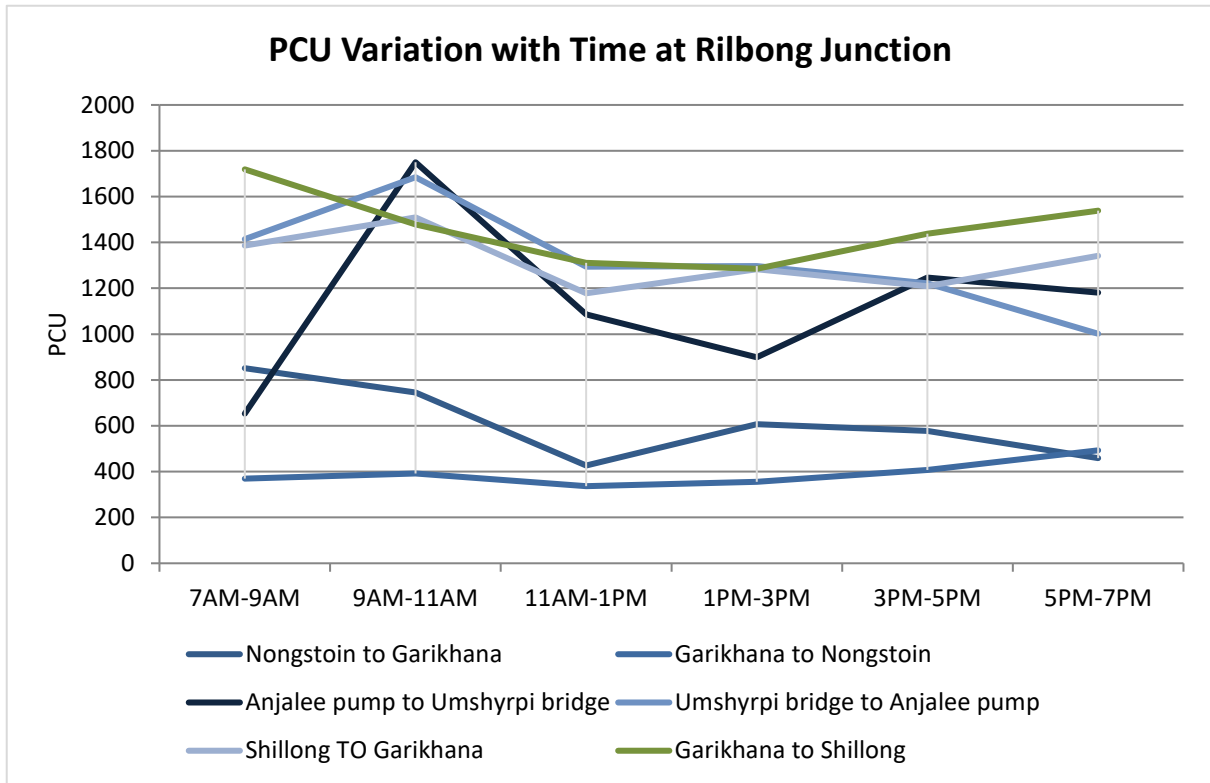


Figure 7-19: PCU Variation with Time at Rilbong Junction

Table 7-7: Observed Peak Volumes and Total PCU at Rhino Junction

Name Of The Road	Observed Peak Volume 2019 (PCU/Hr)	Total PCU 2019 (7am-7pm)
Umshyrpi bridge to Garikhana	426	3667
Garikhana to Umshyrpi bridge)	246	2353
Anjalee pump to Umshyrpi bridge	875	6816
Umshyrpi bridge to Anjalee pump	842	7915
Anjalee pump to Garikhana	755	7909
Garikhana to Anjalee pump	860	8770

Level of service (LOS) calculation at the junction shows that the V/C ratio for the directions 'junction to Anjalee pump', 'junction to Garikhana' and 'junction to Umshyrpi bridge' are 2.14, 1.44 and 1.52 respectively, which are equivalent to LOS of F (Figure 7-20).

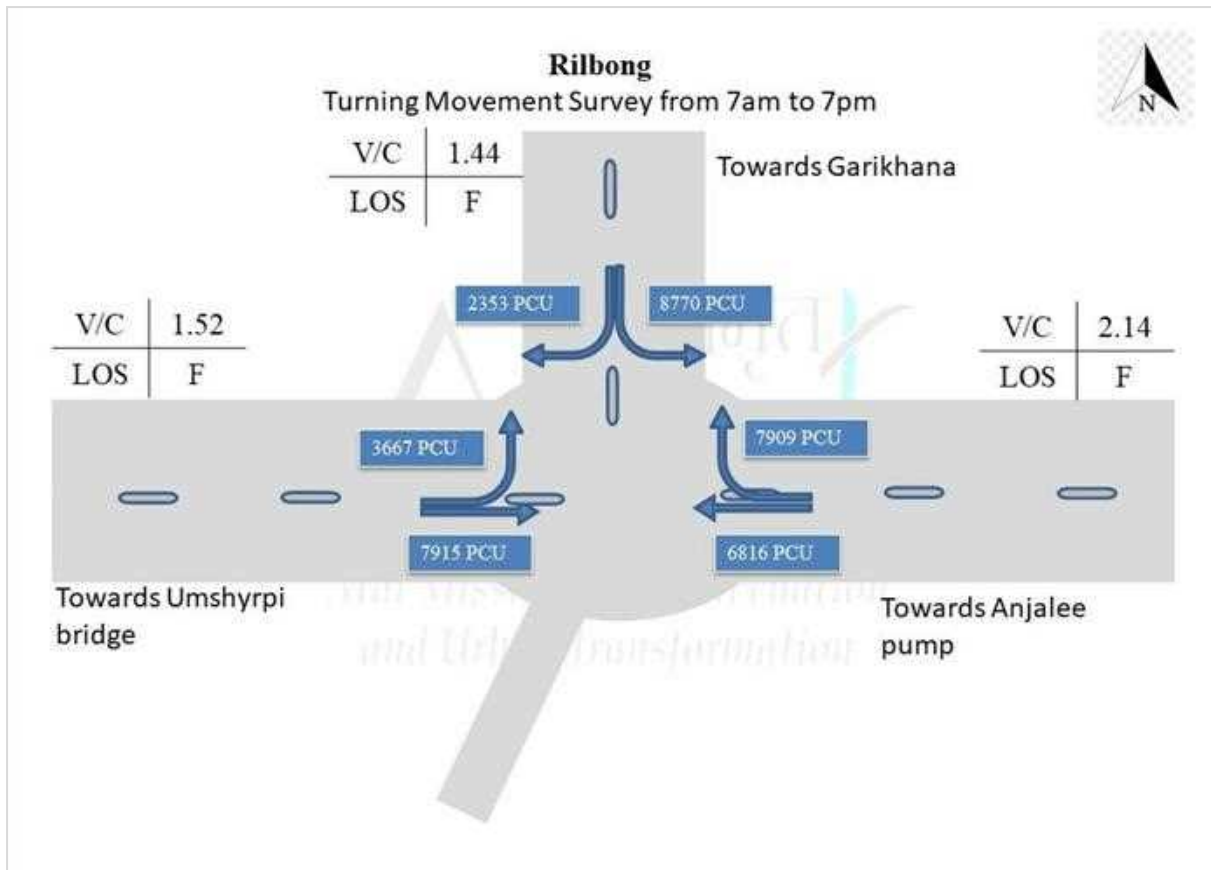


Figure 7-20: LOS and total PCU counts at Rilbong Junction

#### 7.1.6.1.7 NAME OF THE JUNCTION- NONGRIM HILLS

Nongrim hills junction faces occasional traffic congestion. At this junction, direction ‘MES to Rynjah’ has highest percentage traffic share of 55.84% (Table 7-8). This share is higher than others are because in the evening time during survey, one-way traffic from ‘MES to Rynjah’ gradually increased because of some traffic control measures in the city. Peak traffic flow for the direction, ‘MES to Rynjah’ have been observed 5-7PM (Figure 7-21).

Table 7-8: Observed Peak Volumes and Total PCU at Nongrim Hills Junction

Name of The Road	Observed Peak Volume 2019 (PCU/Hr)	Total PCU 2019 (7am-7pm)
MES to Rynjah	2037	14817
Rynjah to MES	471	3816
Rynjah to Nongrim Hills	323	3402
Nongrim Hills to Rynjah	267	2776
MES to Nongrim Hills	111	1052
Nongrim hills to MES	85	673

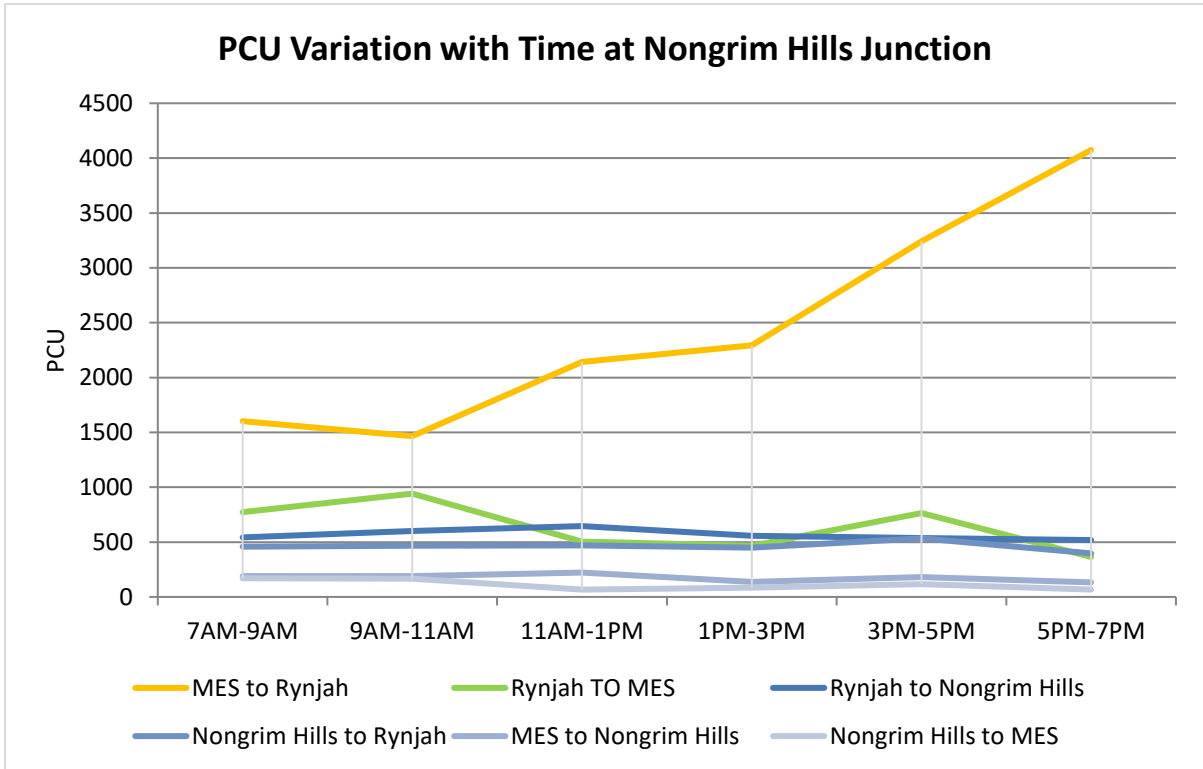


Figure 7-21: PCU Variation with Time at Nongrim Hills Junction

Level of service (LOS) calculation at the junction shows that the V/C ratios for the directions ‘Junction to MES’, ‘Junction to Rynjah’ and ‘junction to Nongrim hills’ are 1.55, 1.78 and 0.59 respectively and their corresponding LOS are F, F and A respectively (Figure 7-22).

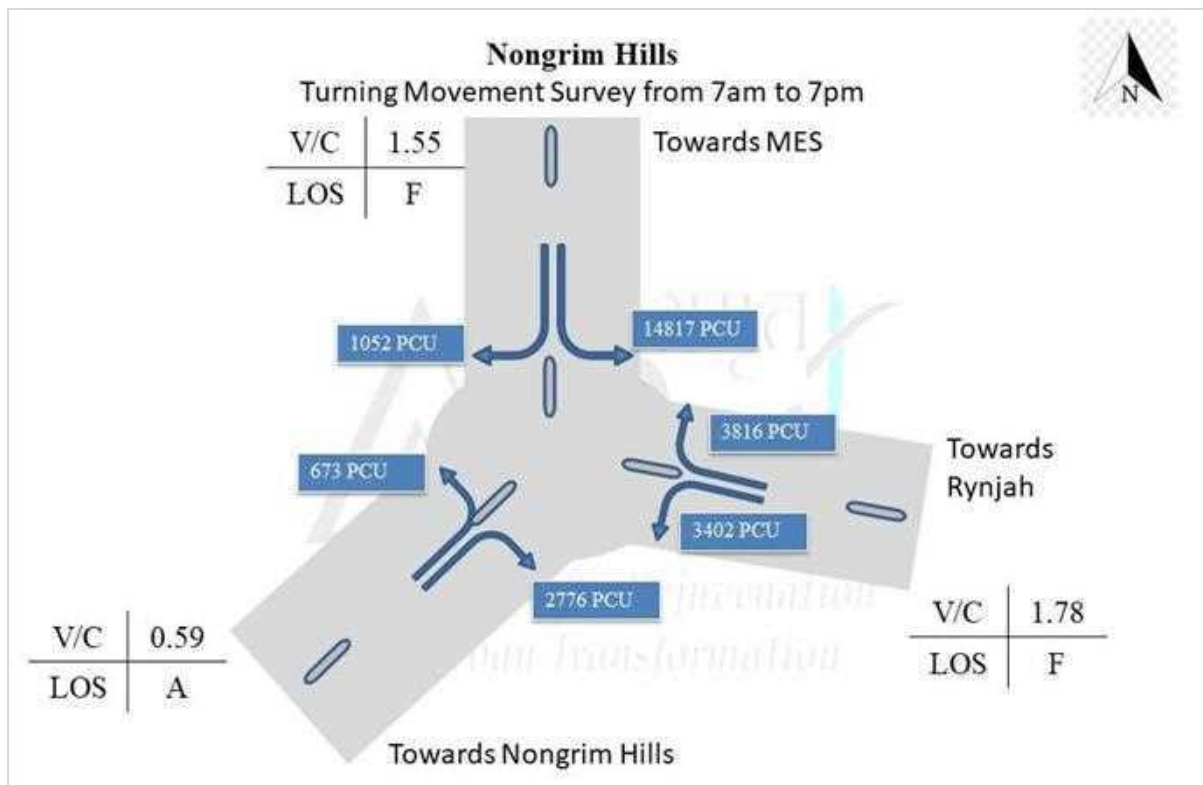


Figure 7-22: LOS and total PCU counts at Nongrim Hills Junction

### 7.1.6.1.8 NAME OF THE JUNCTION- ISHYRWAT JUNCTION

Ishyrwat junction rarely faces traffic congestion. At this junction, NEIGRIMHS to Shillong and Shillong to NEIGRIHMS directions have percentage traffic shares of 21.64% and 24.83% respectively (Table 7-9). These two directions are the main traffic directions.

Peak hour traffic flows for the main directions have been observed between 7-9AM (Figure 7-23).

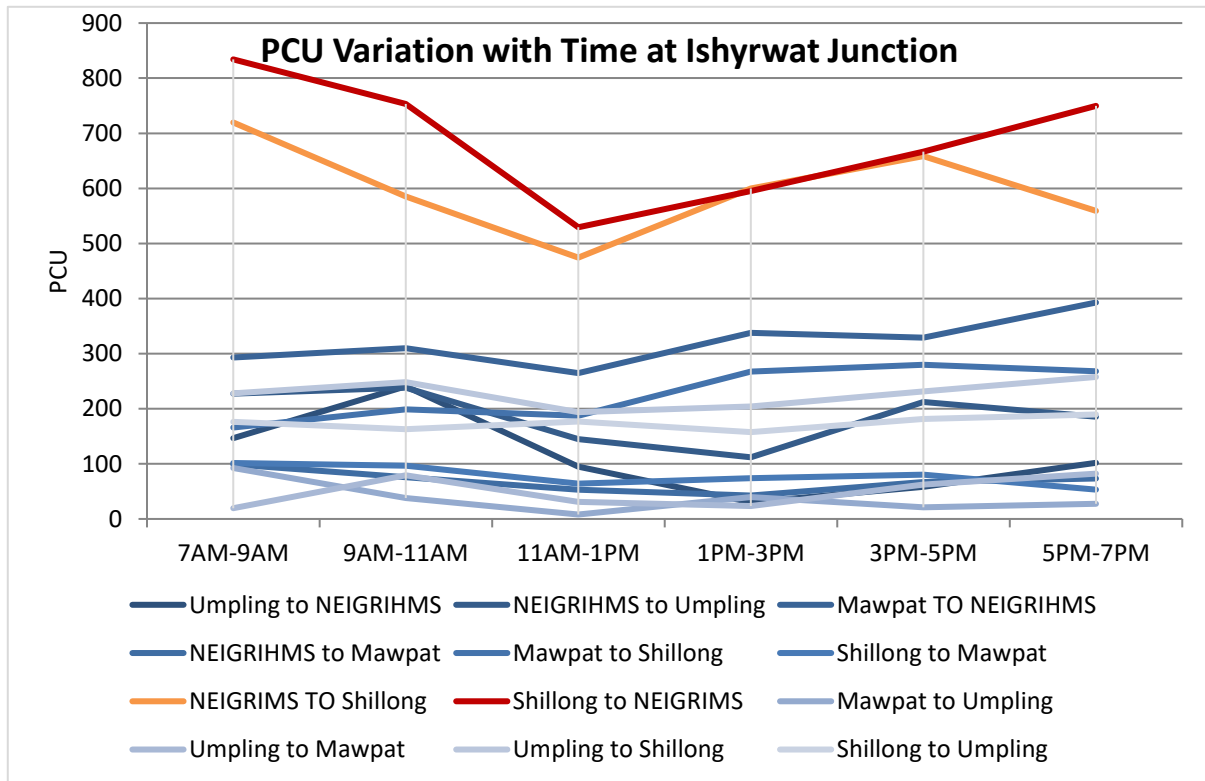


Figure 7-23: PCU Variation with Time at Ishyrwat Junction

Table 7-9: Observed Peak Volumes and Total PCU at Ishyrwat Junction

Name Of The Road	Observed Peak Volume 2019 (PCU/Hr)	Total PCU 2019 (7am-7pm)
Umpling to NEIGRIHMS	120	672
NEIGRIHMS to Umpling	119	1120
Mawpat to NEIGRIHMS	196	1927
NEIGRIHMS to Mawpat	50	411
Mawpat to Shillong	140	1368
Shillong to Mawpat	51	470
NEIGRIHMS to Shillong	360	3597
Shillong to NEIGRIHMS	417	4128
Mawpat to Umpling	46	226
Umpling to Mawpat	41	297
Umpling to Shillong	129	1363
Shillong to Umpling	95	1044

Level of service (LOS) calculation at the junction shows that the V/C ratios for directions 'junction to Shillong' and 'Shillong to junction' are 0.74 and 0.77, which are equivalent to LOS of C. Other two directions 'junction to Mawpat' and 'junction to Umpling' have V/C ratios of 0.37 and 0.42 respectively, which are equivalent to LOS of A (Figure 7-24).

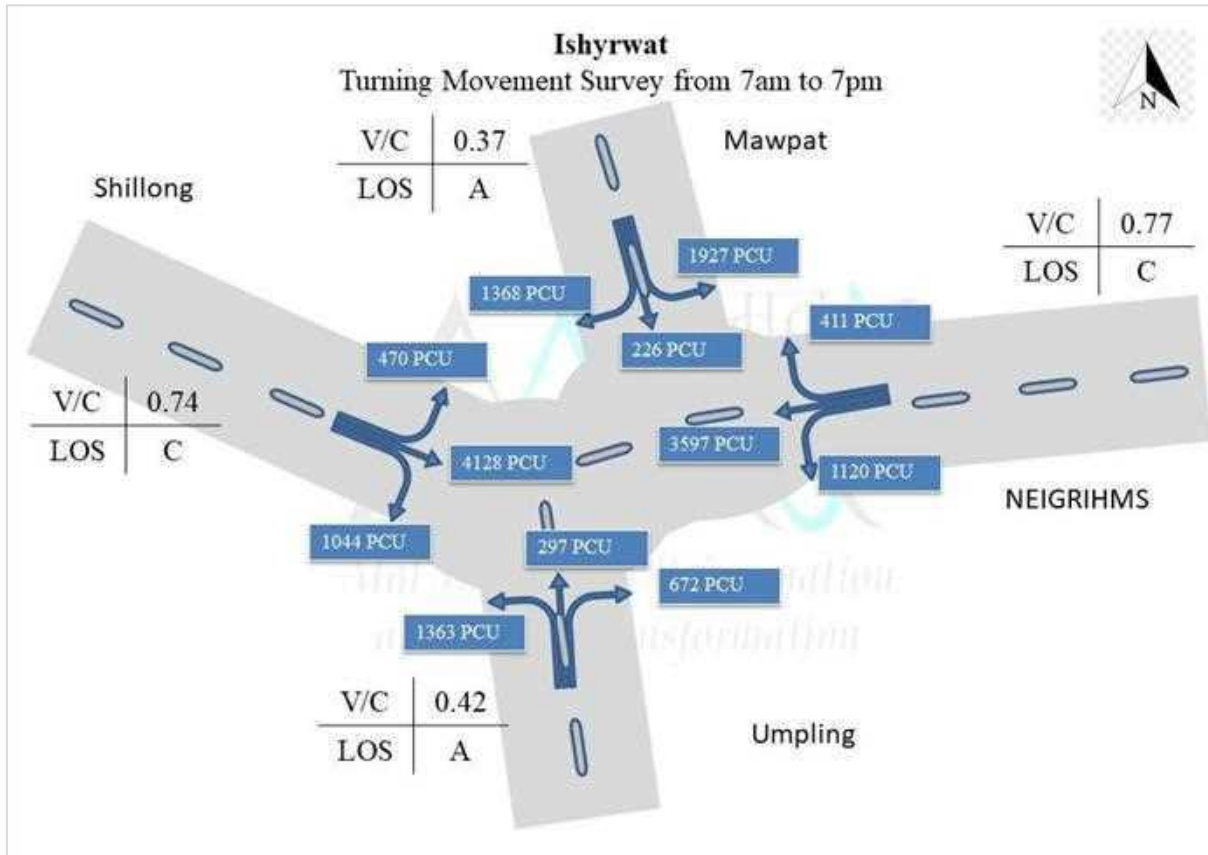


Figure 7-24: LOS and total PCU counts at Ishyrwat Junction

#### 7.1.6.1.9 NAME OF THE JUNCTION- AG POINT

AG junction faces traffic congestion because of traffic coming from DC office and Ward's lake and going towards the IGP junction and MBOSE office. At this junction, directions 'DC office to Ward's lake', 'DC office to IGP' and 'DC office to MBOSE office' have percentage traffic shares of 26.54%, 23.76% and 23.49% respectively. Other directions 'Ward's lake to IGP' and 'Ward's lake to MBOSE office' have percentage traffic shares of 22.51% and 3.70% respectively (Table 7-10). Peak hour traffic flows have been observed at the junction between 5-7 PM (Figure 7-25).

Table 7-10: Observed Peak Volumes and Total PCU at AG Junction

Name Of The Road	Observed Peak Volume 2019 (PCU/Hr)	Total PCU 2019 (7am-7pm)
DC Office to Ward's Lake	933	8527
DC office to IGP	704	7633
Ward's Lake to IGP	742	7231
DC office to MBOSE	735	7548
Ward lake to MBOSE office	143	1189

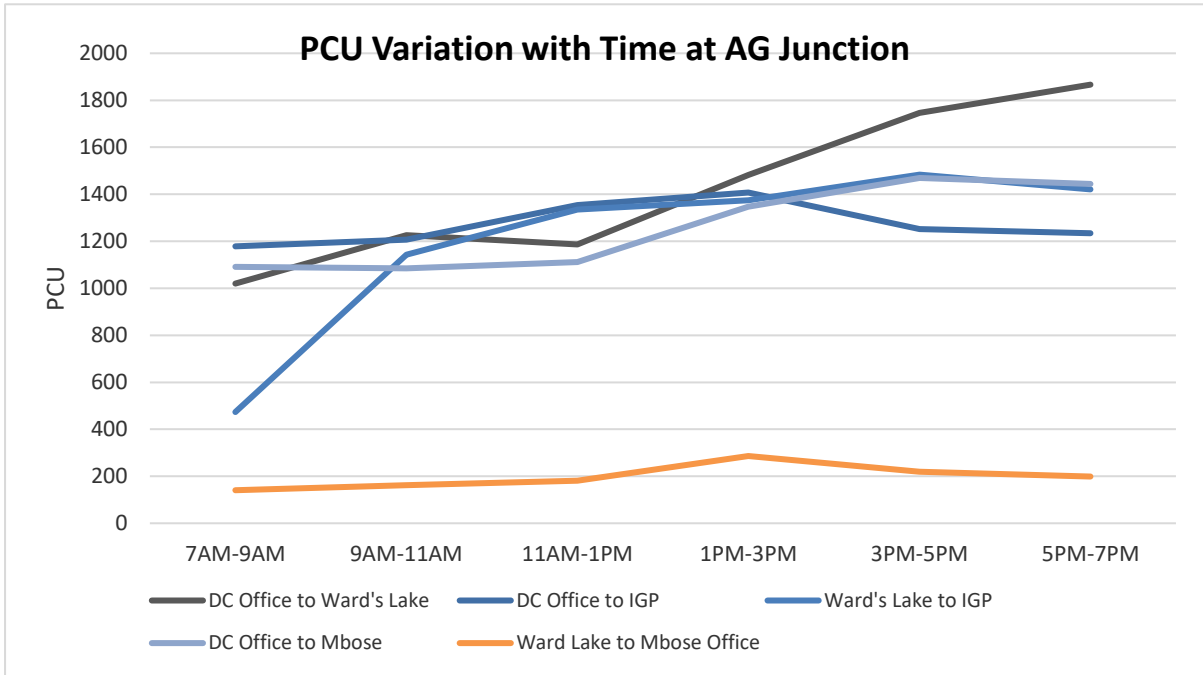


Figure 7-25: PCU Variation with Time at AG Junction

Level of service (LOS) calculation at the junction shows that the V/C ratios for the directions 'junction to DC office', 'junction to Ward's lake' and 'junction to IGP point' are 0.82, 1.37 and 0.73 respectively and their corresponding LOS are D, F and C respectively. Direction 'junction to MBOSE office' has V/C ratio of 0.44, which is equivalent to LOS of A (Figure 7-26).

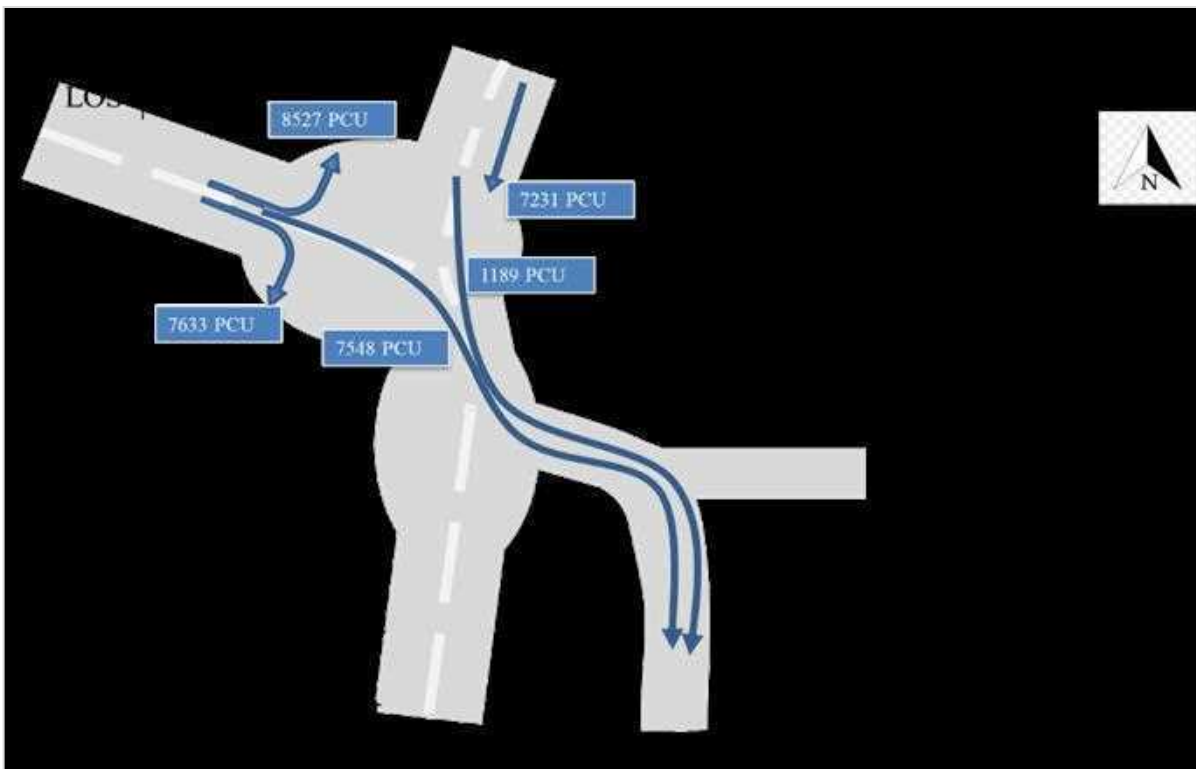


Figure 7-26: LOS and total PCU counts at AG Junction



### 7.1.6.1.10 NAME OF THE JUNCTION- IGP POINT

IGP junction is a 3-legged junction and is one of the congested junctions in the city. At this junction, three major directions 'Barik to PB', 'AG to PB' and 'AG to Barik' have percentage traffic flow shares of 37.67%, 34.59% and 27.04% respectively. Minor direction 'IGP to Keating road' has percentage traffic flow share of only 0.70% (Table 7-11).

Peak hour traffic flows for both the directions 'Barik to PB' and 'AG to Barik' have been observed between 9-11AM and 3-5PM while for the direction 'AG to PB', peak hour traffic flow has been observed between 9-11AM (Figure 7-27).

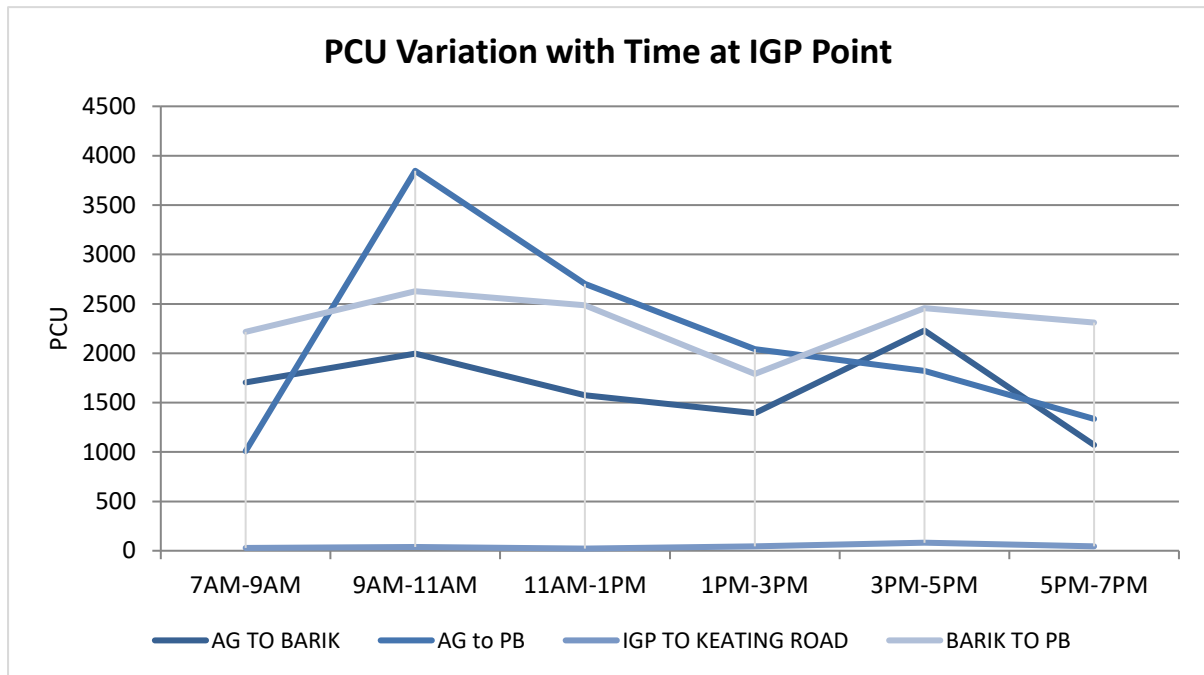


Figure 7-27: PCU Variation with Time at IGP Point

Table 7-11: Observed Peak Volumes and Total PCU at IGP Point

Name Of The Road	Observed Peak Volume 2019 (PCU/Hr)	Total PCU 2019 (7am-7pm)
AG to Barik	1115	9969
AG to PB	1924	12755
IGP TO Keating Road	41	259
Barik to PB	1314	13888

Level of service (LOS) calculation at the junction shows that the V/C ratios for the directions 'junction to PB', 'junction to AG' and 'junction to Barik' are 1.7, 1.54 and 1.56 respectively and these all have LOS of F (Figure 7-28).

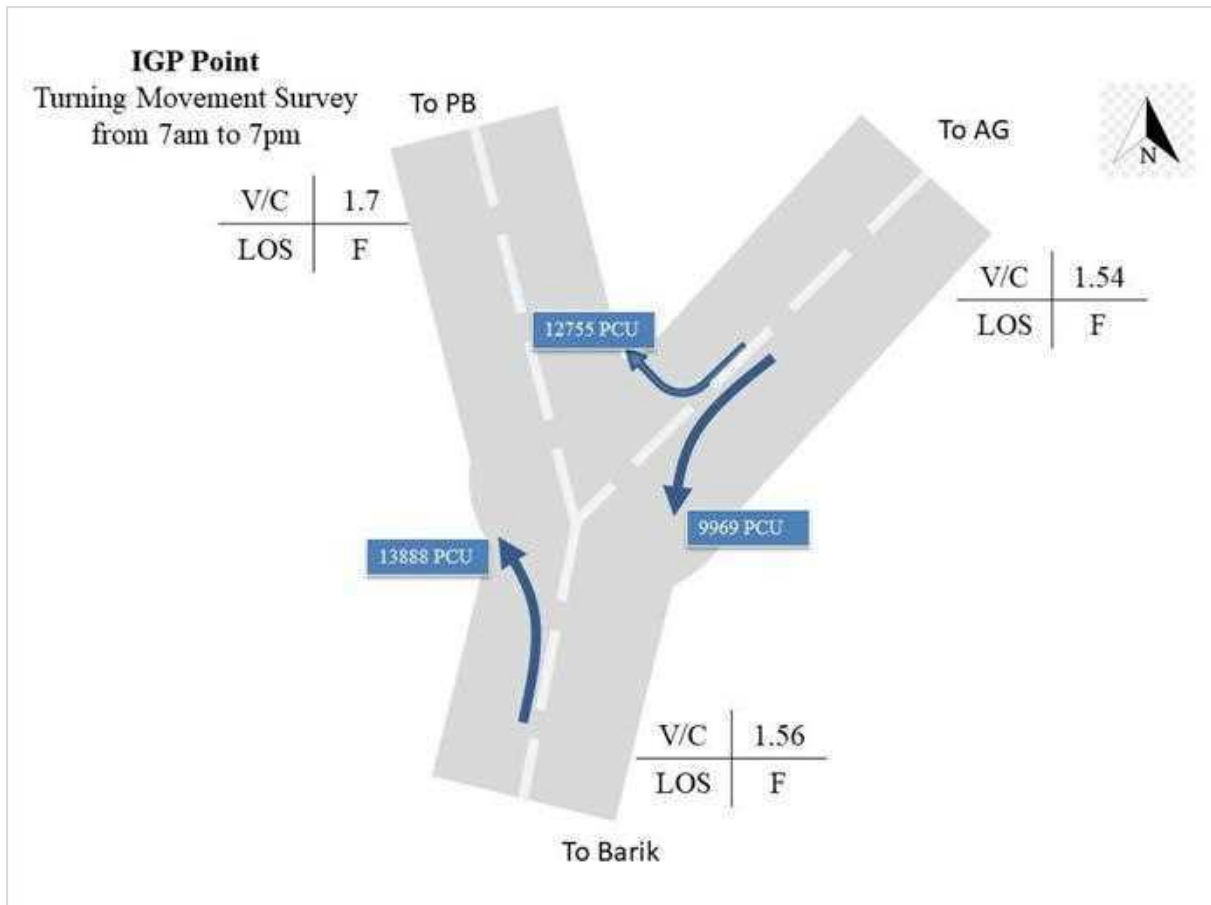


Figure 7-28: LOS and total PCU counts at IGP Point

#### 7.1.6.1.11 NAME OF THE JUNCTION- MALKI POINT

Malki point is one of the most congested junctions in the Shillong city. At this junction, directions 'Dhankheti to Barik' and 'Barik to Dhankheti' are the main directions and have percentage traffic shares of 59.24% and 25.61% respectively (Table 7-12). Direction 'Dhankheti to Barik' has heavy traffic flow during the whole day.

Peak hour traffic flows for the direction 'Dhankheti to Barik' have been observed between 9-11 AM and 5-7 PM while for the direction 'Barik to Dhankheti', peak hour traffic flow has been observed between 1-3 PM (Figure 7-29).

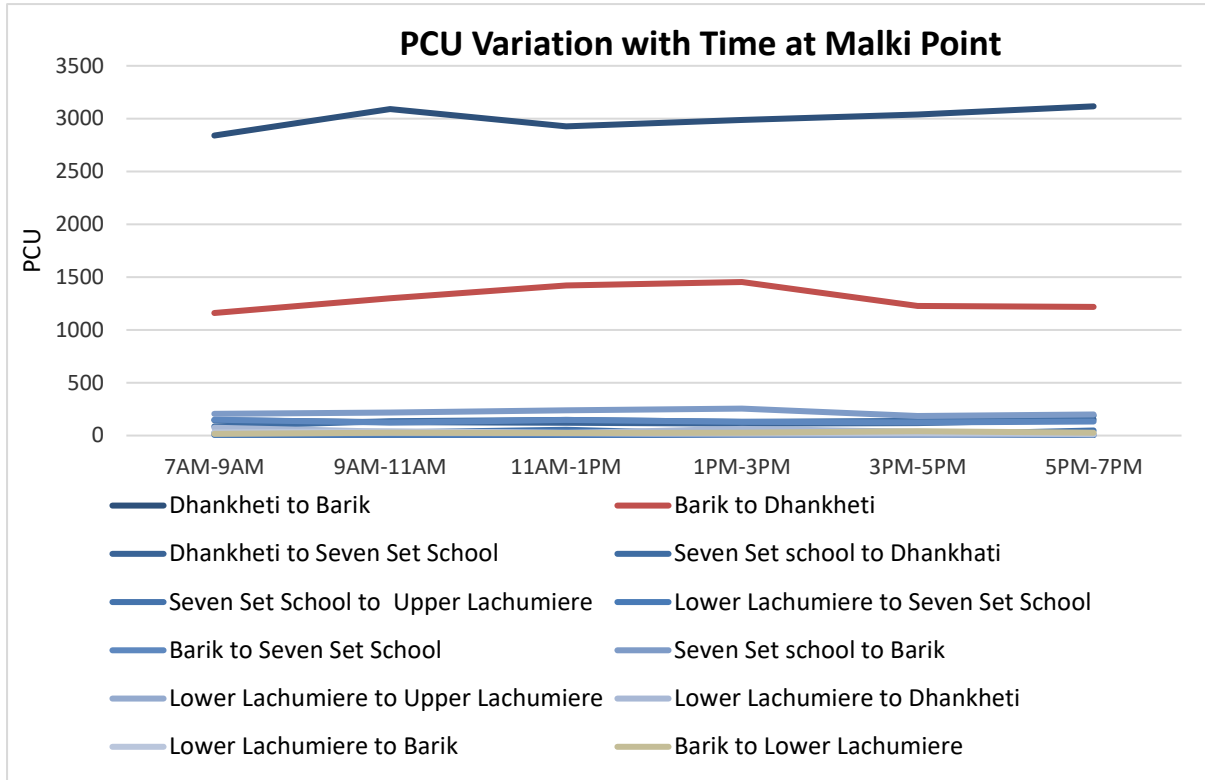


Figure 7-29: PCU Variation with Time at Malki Point

Table 7-12: Observed Peak Volumes and Total PCU at Malki Point

Name Of The Road	Observed Peak Volume 2019 (PCU/Hr)	Total PCU 2019 (7am-7pm)
Dhankheti to Barik	1558	18002
Barik to Dhankheti	727	7782
Dhankheti to Seven Set School	76	778
Seven Set school to Dhankheti	94	828
Seven Set School to Upper Lachumiere	28	182
Lower Lachumiere to Seven Set School	5	32
Barik to Seven Set School	75	811
Seven Set school to Barik	128	1305
Lower Lachumiere to Upper Lachumiere	12	93
Lower Lachumiere to Dhankheti	37	247
Lower Lachumiere to Barik	20	163
Barik to Lower Lachumiere	21	164

Level of service (LOS) calculation at the junction shows that the V/C ratios for the directions 'junction to Barik' and 'junction to Dhankheti' are 1.63 and 1.58 respectively and both these directions have LOS of F (Figure 7-30).

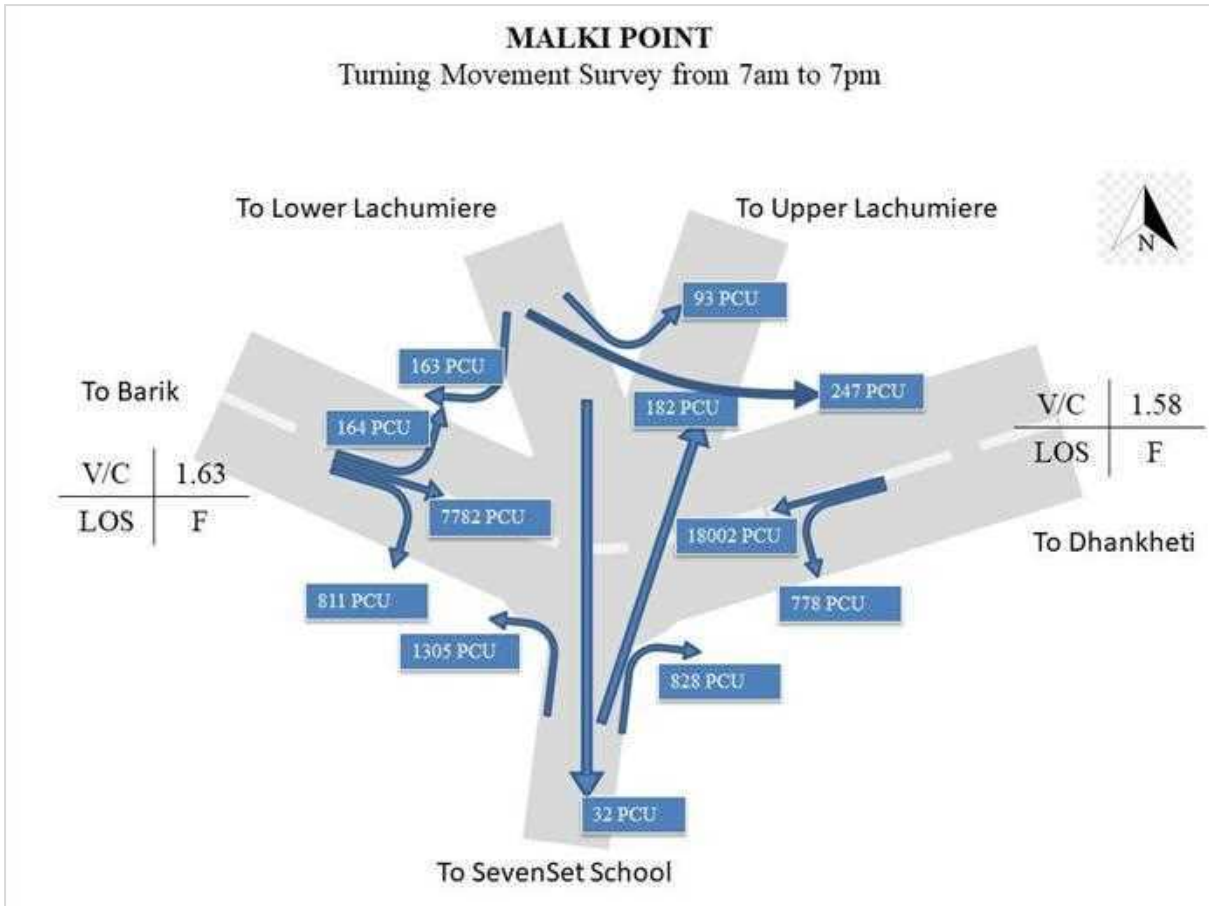


Figure 7-30: LOS and total PCU counts at Malki Point

### 7.1.6.1.12 NAME OF THE JUNCTION- LAST STOP JUNCTION

Last stop junction does not face traffic congestion. At this junction, directions 'Laban to Rhino', 'Rhino to Laban', 'Rhino to Bishnupur' and 'Bishnupur to Rhino' have percentage traffic shares of 35.19%, 11.02%, 14.50% and 25.74% respectively (Table 7-13).

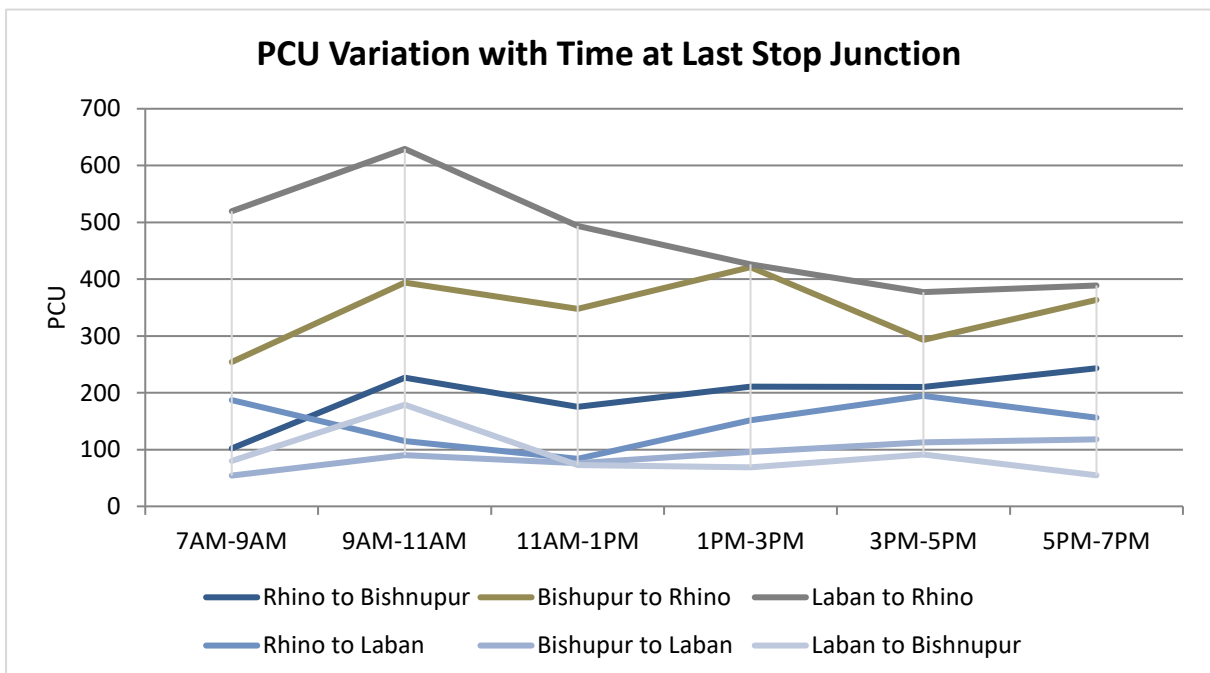


Figure 7-31: PCU Variation with Time at Last Stop Junction

Table 7-13: Observed Peak Volumes and Total PCU at Last Stop Junction

Name Of The Road	Observed Peak Volume 2019 (PCU/Hr)	Total PCU 2019 (7am-7pm)
Rhino to Bishnupur	122	1168
Bishnupur to Rhino	211	2073
Laban to Rhino	315	2835
Rhino to Laban	97	887
Bishnupur to Laban	59	546
Laban to Bishnupur	90	546

Level of service (LOS) calculation at the junction shows that all three directions at the junction have LOS of A (Figure 7-32).

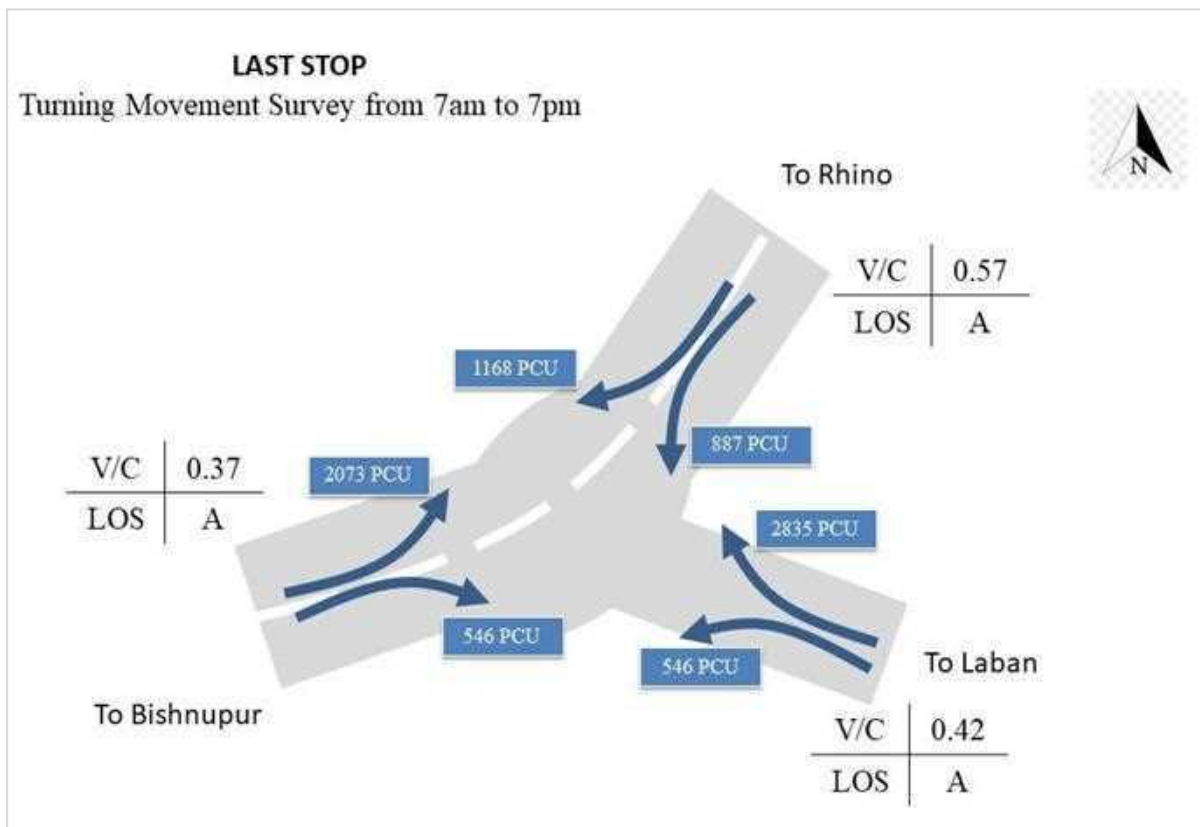


Figure 7-32: LOS and total PCU counts at Last Stop Junction

#### 7.1.6.1.13 NAME OF THE JUNCTION- WEIKING POINT

Weiking point faces occasional traffic congestion because of sharp turn at the junction. Traffic police has to stop the traffic coming from the Guwahati side to pass the traffic coming from the Nongpdeng indoor stadium and going towards Guwahati side. Traffic from direction 'Nongpdeng indoor stadium to Guwahati' blocks the traffic coming from the Guwahati side and this results in traffic congestion. At this junction, directions 'Guwahati to Shillong', 'Shillong to Guwahati', Guwahati to Nongpdeng indoor stadium' and 'Nongpdeng

indoor stadium to Guwahati’ have percentage traffic shares of 30.07%, 32.36%, 14.87% and 14.42% respectively (Table 7-14).

Peak hour traffic flows for direction ‘Guwahati to Shillong’ have been observed two times i.e. between 9-11AM and between 1-3PM. While Peak hour traffic flow for the direction ‘Shillong to Guwahati’ has been observed only between 3-5 PM. For the directions ‘Nongpdeng indoor stadium to Guwahati’ and ‘Guwahati to Nongpdeng indoor stadium’, peak hour traffic flow has been observed between 9-11AM (Figure 7-33).

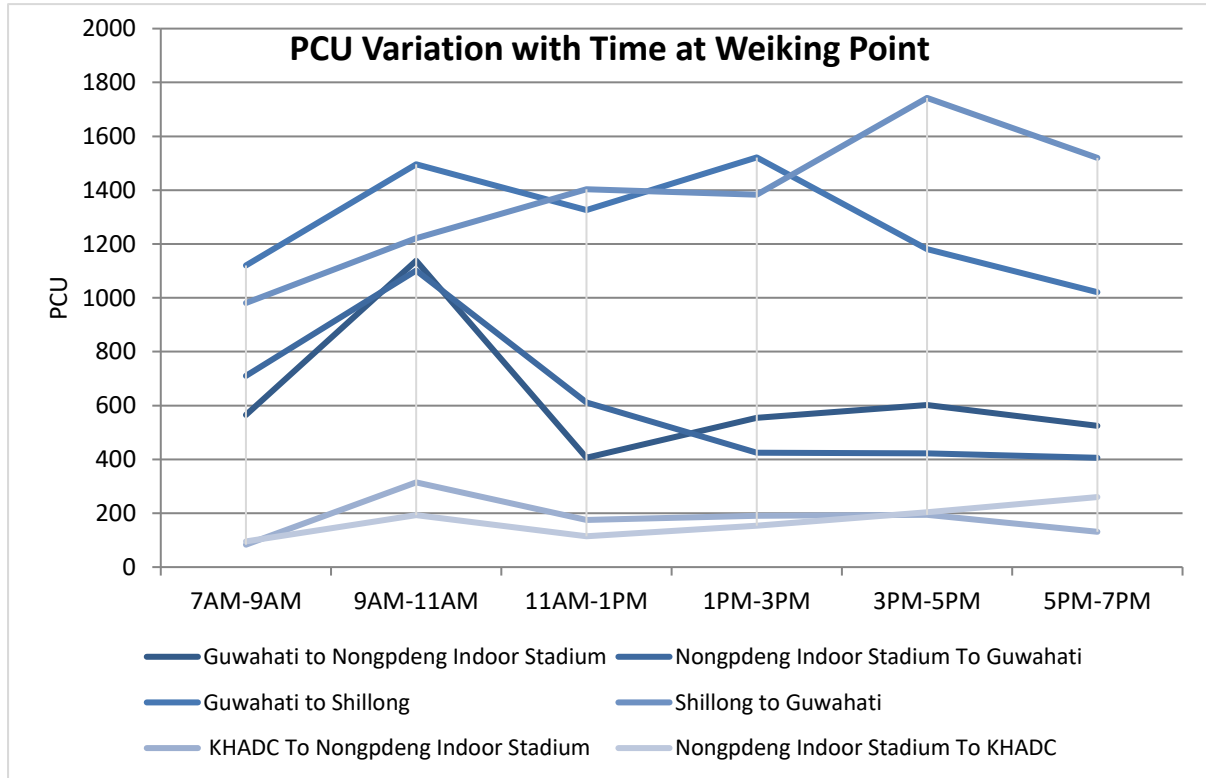


Figure 7-33: PCU Variation with Time at Weiking Point

Table 7-14: Observed Peak Volumes and Total PCU at Weiking Point

Name Of The Road	Observed Peak Volume 2019 (PCU/Hr)	Total PCU 2019 (7am-7pm)
Guwahati to Nongpdeng Indoor Stadium	569	3790
Nongpdeng Indoor Stadium to Guwahati	551	3677
Guwahati to Shillong	761	7666
Shillong to Guwahati	871	8250
KHADC(Shillong) to Nongpdeng Indoor Stadium	157	1089
Nongpdeng Indoor Stadium to KHADC(Shillong)	130	1020

Level of service (LOS) calculation at the junction shows that the V/C ratios for the directions ‘junction to Guwahati’, ‘junction to Nongpdeng indoor stadium’ and ‘junction to Shillong’ are 1.65, 1.14 and 1.11 respectively and all the three directions have LOS of F (Figure 7-34).

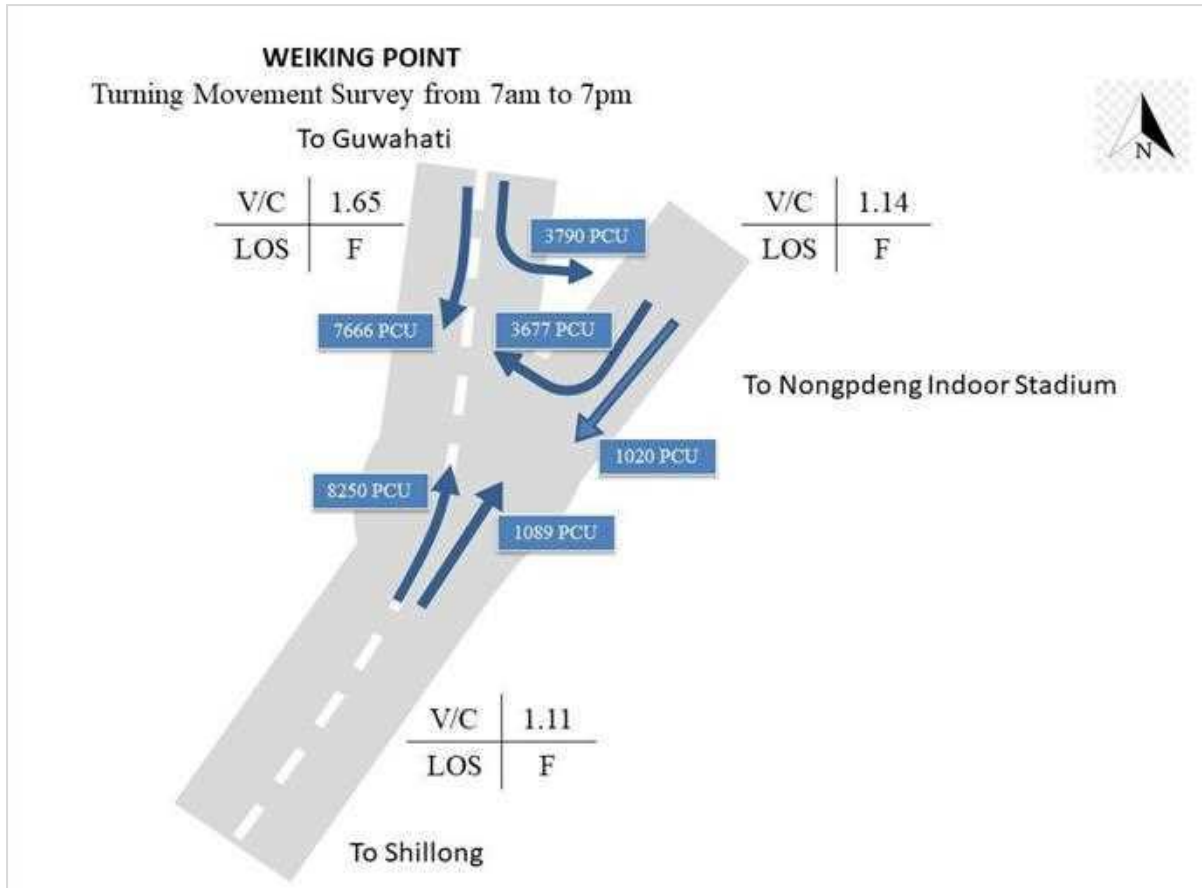


Figure 7-34: LOS and total PCU counts at Weiking Point

#### 7.1.6.1.14 NAME OF THE JUNCTION- MOTPHRAN

Mothphran junction is congested because of many reasons like on-street vendors, a large number of pedestrians crossing the roads, mixed land use type and taxi stand where taxis block the roads frequently. At the junction, directions 'Jaiaw to Umsohsun', 'Jaiaw to Garikhana', 'Umsohsun to Umsohsun' and 'Umsohsun to Garikhana' have percentage traffic shares of 28.63%, 26.97%, 22.77% and 21.63% respectively (Table 7-15). At this junction, traffic congestion is not because of traffic flow but because of hindrance by the pedestrians on the road.

Peak hour traffic flows for the direction 'Jaiaw to Umsohsun' have been observed three times during the whole day i.e. between 7-9 AM, 11 AM-1 PM and 5-7 PM. While for the direction 'Jaiaw to Garikhana', peak hour traffic flows have been observed 2 times during the whole day i.e. between 9-11 AM and 5-7 PM. For the direction 'Umsohsun to Garikhana', peak hour traffic flows have been observed between 9-11 AM and 3-5 PM, while direction 'Umsohsun to Umsohsun', peak hour traffic flow has been observed in the evening time between 5-7 PM. (Figure 7-35).

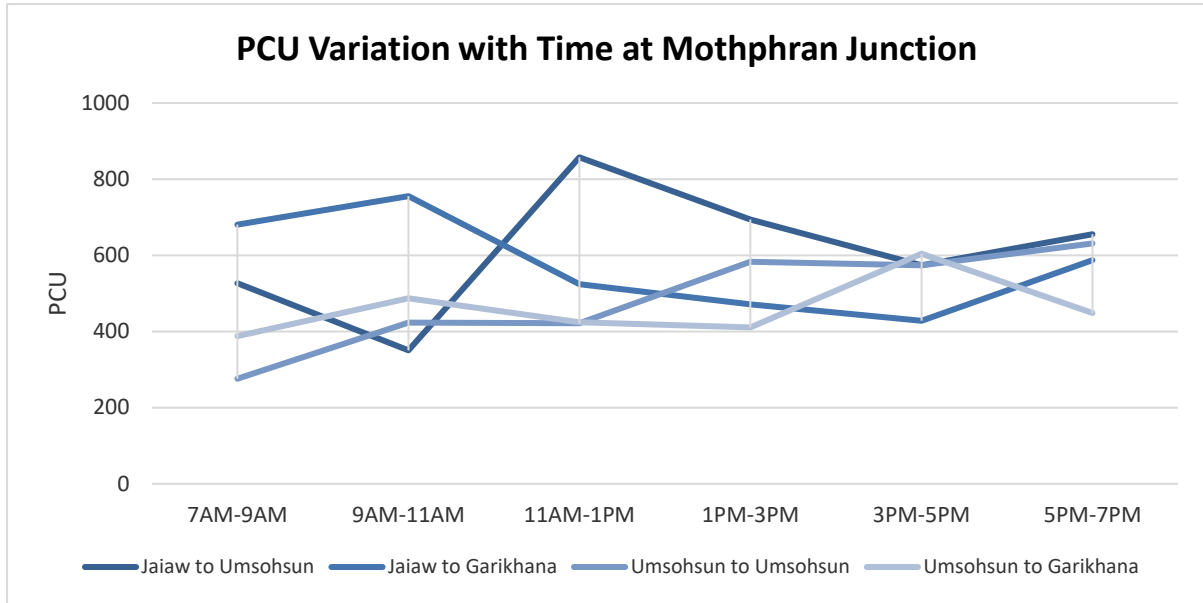


Figure 7-35: PCU Variation with Time at Mothphran Junction

Table 7-15: Observed Peak Volumes and Total PCU at Mothphran Junction

Name Of The Road	Observed Peak Volume 2019 (PCU/Hr)	Total PCU 2019 (7am-7pm)
Jaiaw to Umsosun	429	3658
Jaiaw to Garikhana	378	3446
Umsosun to Umsosun	316	2910
Umsosun to Garikhana	302	2763

Level of service (LOS) calculation at the junction shows that the V/C ratios for the directions ‘junction to Jaiaw’, ‘junction to Umsosun’ and ‘junction to Garikhana’ are 0.36, 0.73 and 0.33 respectively and their corresponding LOS are A, C, and A respectively (Figure 7-36).

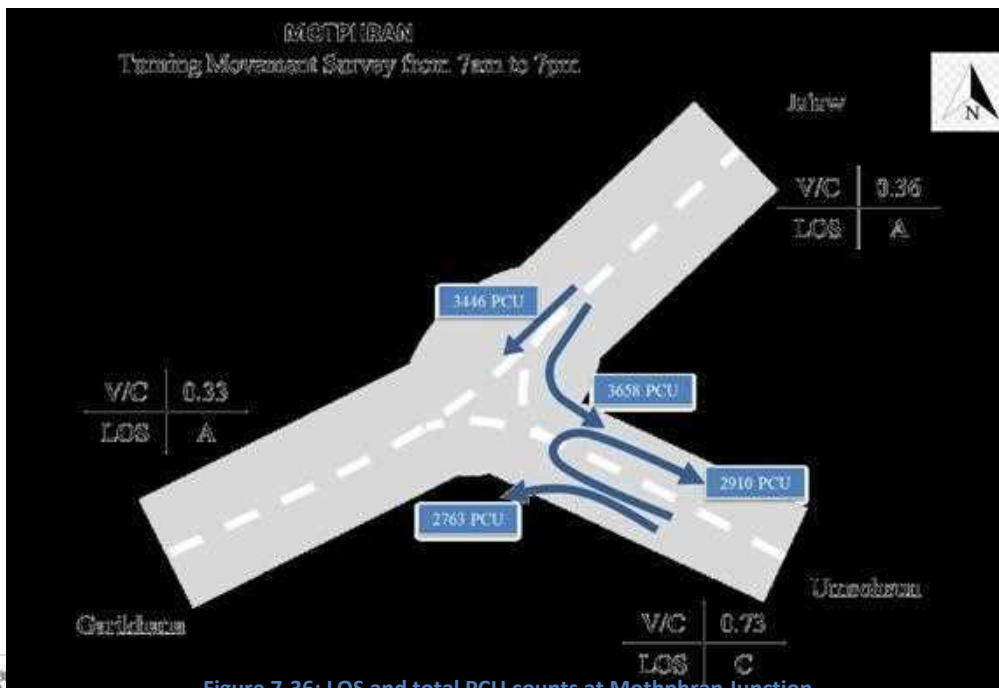


Figure 7-36: LOS and total PCU counts at Mothphran Junction



### 7.1.6.1.15 NAME OF THE JUNCTION- MAWLONGHAT

Near Mawlonghat, traffic count was conducted to know the LOS of the road segment. Traffic movement directions, 'Anjali pump to Lewduh' and 'Lewduh to Anjali pump' have percentage traffic shares of 31.10% and 68.90% respectively (Table 7-16).

Peak hour traffic for the direction, 'Anjali pump to Lewduh' has been observed between 9-11AM while the same for the direction, 'Lewduh to Anjali pump' has been observed between 5-7PM (Figure 7-37).

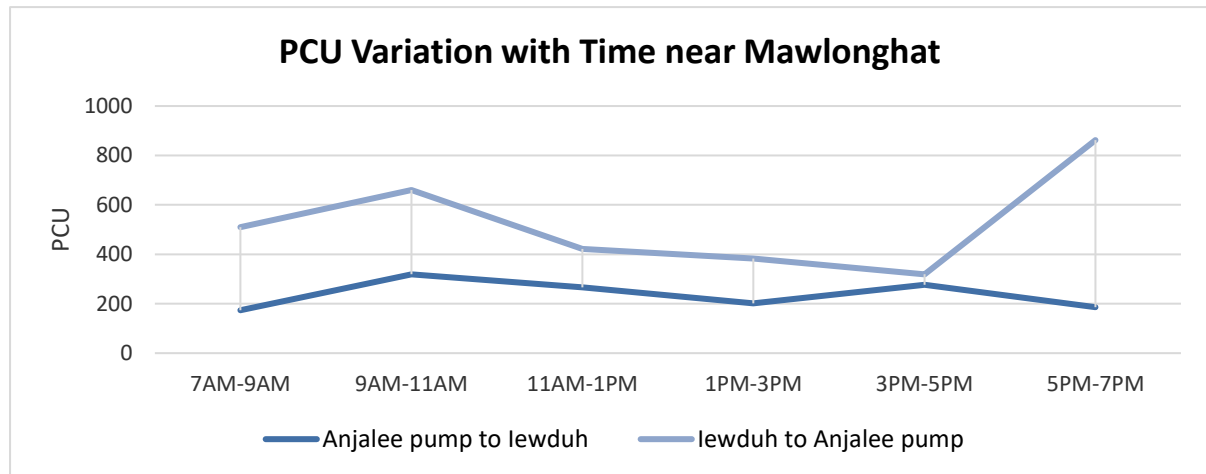


Figure 7-37: PCU Variation with Time near Mawlonghat

Table 7-16: Observed Peak Volumes and Total PCU near Mawlonghat

Name Of The Road	Observed Peak Volume 2019 (PCU/Hr)	Total PCU 2019 (7am-7pm)
Anjalee pump to Lewduh	160	1424
Lewduh to Anjalee pump	431	3155

Level of service (LOS) calculation for the road segment shows that the V/C ratio is 0.44 i.e. equivalent to LOS of A (Figure 7-40).

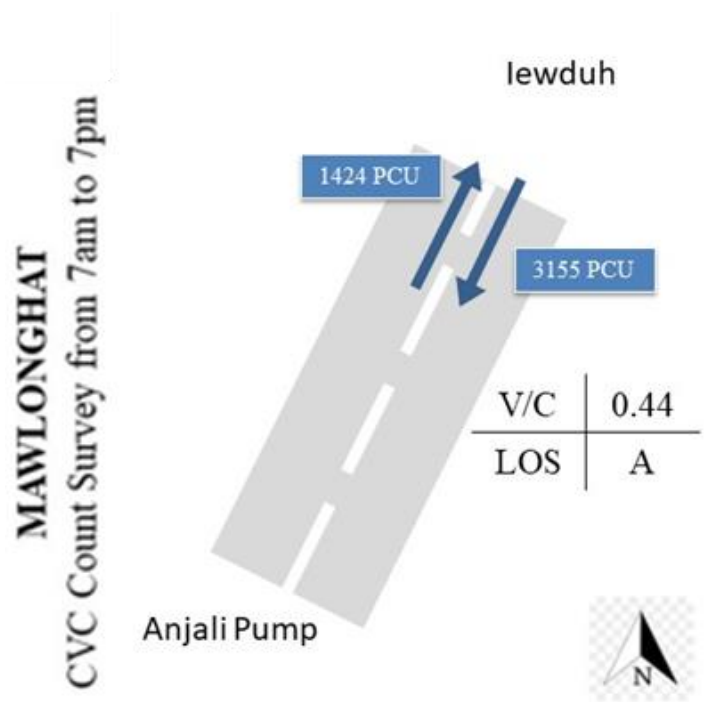


Figure 7-38: LOS and total PCU counts near Mawlonghat

## 7.1.7 ORIGIN-DESTINATION SURVEY AT CORDON POINTS

Origin-Destination was conducted by 'Roadside Interview Method'. Roadside interview involves directing coming vehicles to a designated place for interview and trained professional asks questions related to the OD survey. This technique of OD survey is been used widely because it results in complete information of the trips. The disadvantage of this method of OD survey is that it requires more trained personnel and traffic police to control traffic at the survey site.

For the OD survey, sample size has been taken as follows:

If, Vehicle counts < 1000 then sample size= 12% of Vehicle counts

Else, Sample size= 10% of Vehicle counts.

### 7.1.7.1 RESULTS AND ANALYSIS

#### 7.1.7.1.1 CORDON POINT: UMIAM (NEPA JUNCTION)

DIRECTION: FROM SHILLONG TO GUWAHATI

Calculated sample size = 708

Actual sample surveyed = 161

DIRECTION: FROM GUWAHATI TO SHILLONG

Calculated sample size = 629

Actual sample surveyed = 224

Figure 7-39 shows the mode share for the direction 'from Shillong to Guwahati'. As illustrated, car, taxi and truck constitute most of the mode share having 27%, 28% and 26% respectively. Two-wheeler mode share constitutes only 4% share of travel mode from Shillong to Guwahati at NEPA junction, which shows less use of two-wheeler.

**Mode Share from Shillong to Guwahati**

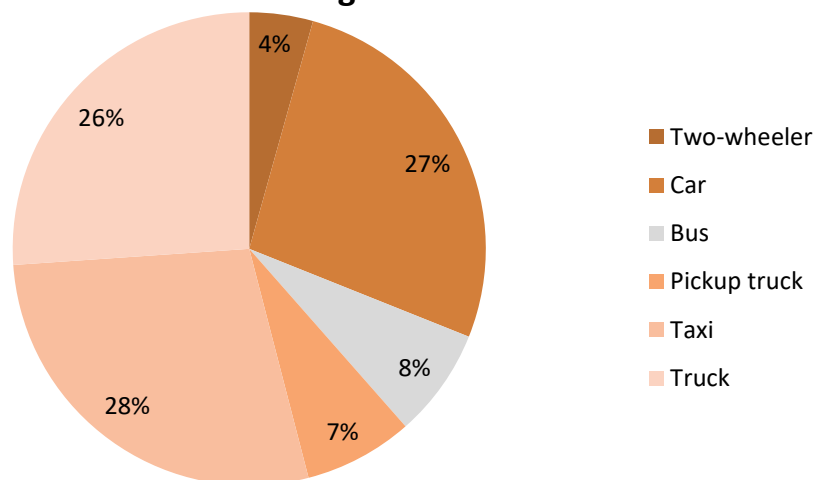


Figure 7-39: Mode Share from Shillong to Guwahati

Figure 7-40 shows the mode share for the direction ‘from Guwahati to Shillong’. As illustrated, car, taxi and truck constitute most of the mode share having 28%, 38% and 18% respectively. Two-wheeler mode share constitutes on 5% share of travel mode from Guwahati to Shillong at NEPA junction, which also shows less use of two-wheeler.

### Mode Share from Guwahati to Shillong

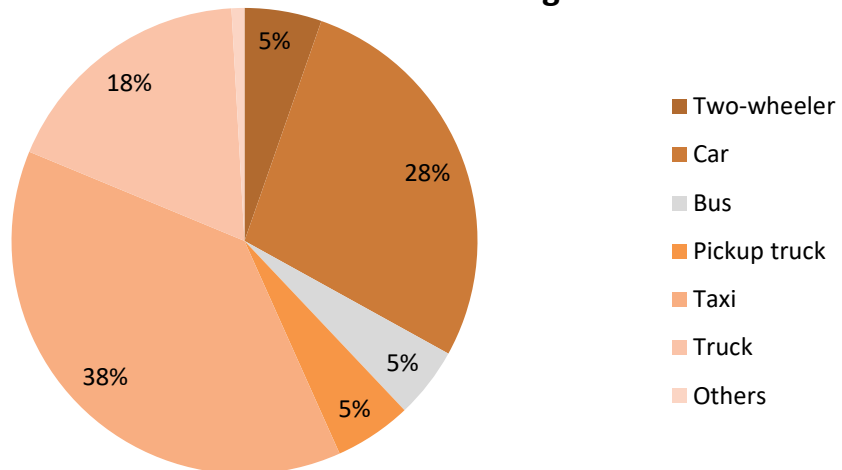


Figure 7-40: Mode Share from Guwahati to Shillong

Figure 7-41 shows the percentage share of purpose of trips for the direction ‘from Shillong to Guwahati’ at NEPA junction. As illustrated, business, work and tourism constitute 38%, 30% and 26% share of purpose respectively. Education and health purpose constitute only 1% and 5% respectively.

### Purpose of trips from Shillong to Guwahati

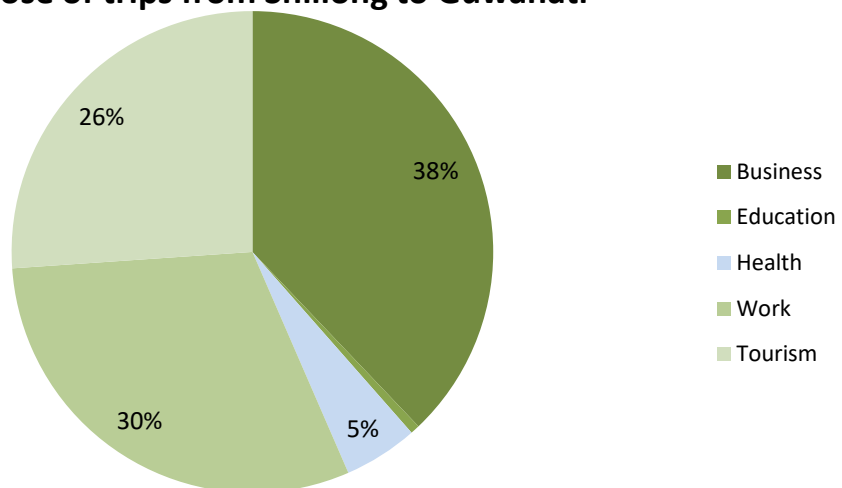


Figure 7-41: Purpose of trips from Shillong to Guwahati

Figure 7-42 shows the percentage share of purpose of trips for the direction ‘from Guwahati to Shillong’ at NEPA junction. As illustrated, business, work and tourism constitute 30%, 30% and 40% share of purpose respectively. It is clear that a large share of vehicles coming from Guwahati to Shillong are tourist vehicles.

### Purpose of trips from Guwahati to Shillong

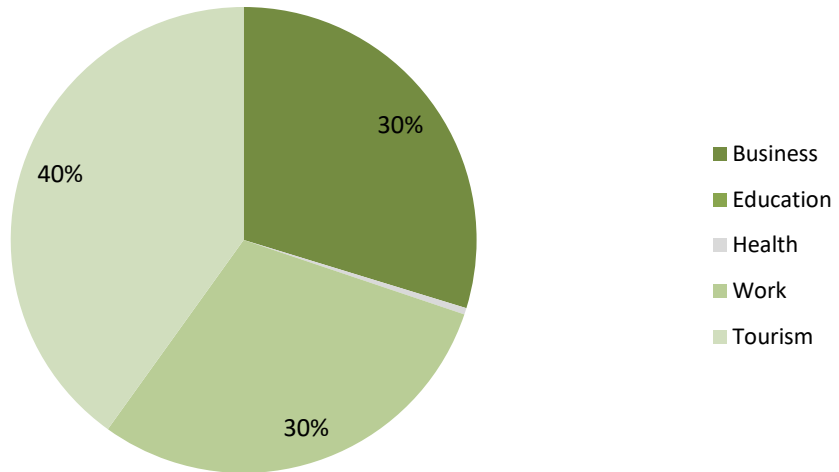


Figure 7-42: Purpose of trips from Guwahati to Shillong

Figure 7-43 shows the percentage share of frequency of trips for the direction ‘from Shillong to Guwahati’ at NEPA junction. As illustrated, daily, weekly and monthly trip frequencies have percentage shares of 41%, 26% and 15% respectively.

### Frequency of trips from Shillong to Guwahati

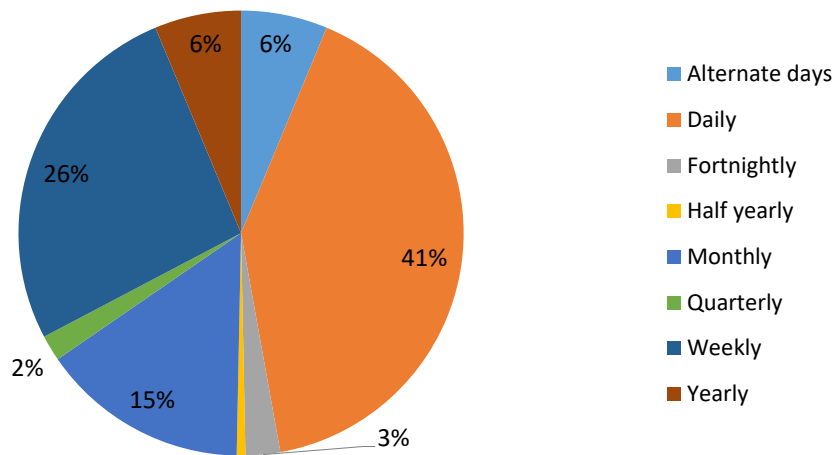


Figure 7-43: Frequency of trips from Shillong to Guwahati

Figure 7-44 shows the percentage share of frequency of trips for the direction ‘from Guwahati to Shillong’ at NEPA junction. As illustrated, daily, weekly and monthly trip frequencies have percentage shares of 65%, 17% and 11% respectively. It is clear that daily trip frequency constitutes highest share in both directions of movement.

### Frequency of trips from Guwahati to Shillong

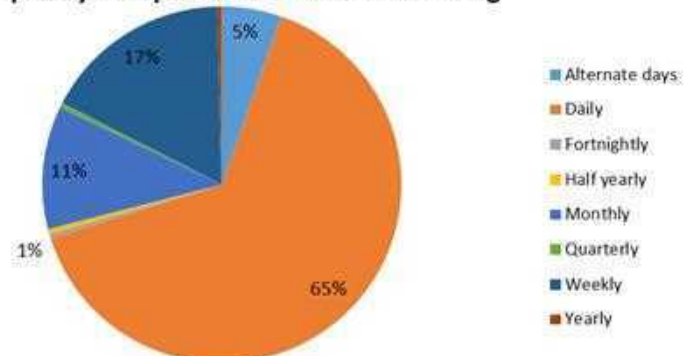


Figure 7-44: Frequency of trips from Guwahati to Shillong

### 7.1.7.1.2 CORDON POINT: MAWLAI MAWKYNROH

DIRECTION: FROM SHILLONG TO MAWTWAR

Calculated sample size = 171

Actual sample surveyed = 198

DIRECTION: FROM MAWTWAR TO SHILLONG

Calculated sample size = 202

Actual sample surveyed = 189

Figure 7-45 shows the mode share for the direction 'from Shillong to Mawtawar'. As illustrated, car and taxi have 48% and 20% mode share respectively.

**Mode Share from Shillong to Mawtawar**

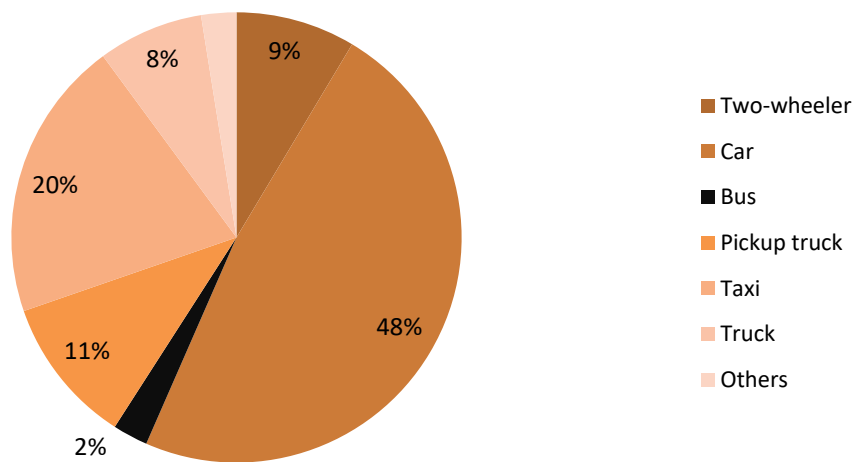


Figure 7-45: Mode Share from Shillong to Mawtawar

Figure 7-46 shows the mode share for the direction 'from Mawtawar to Shillong'. As illustrated, cars and taxis entering the city at the junction 'Mawlai Mawkynroh' have 33% and 52% respectively.

**Mode Share from Mawtawar to Shillong**

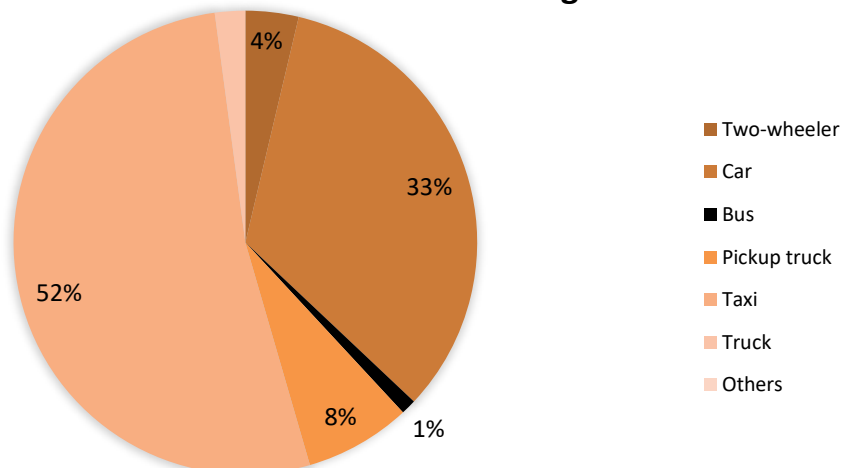


Figure 7-46: Mode Share from Mawtawar to Shillong

Figure 7-47 shows the percentage share of purpose of trips for the direction ‘from Shillong to Mawtawar’ at Mawlai Mawkynroh junction. As illustrated, work and business purpose of trips constitute 50% and 31% respectively.

### Purpose of trips from Shillong to Mawtawar

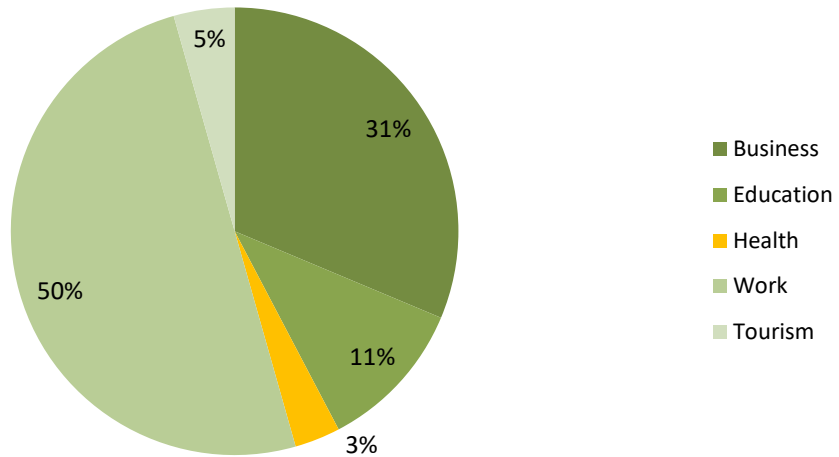


Figure 7-47: Purpose of trips from Shillong to Mawtawar

Figure 7-48 shows the percentage share of purpose of trips for the direction ‘from Mawtawar to Shillong’ at Mawlai Mawkynroh junction. As illustrated, work and business purpose of trips constitute shares 44% and 32% respectively.

It is evident that many people come to Shillong from Mawtawar and surrounding areas for work and business in Shillong city.

### Purpose of trips from Mawtawar to Shillong

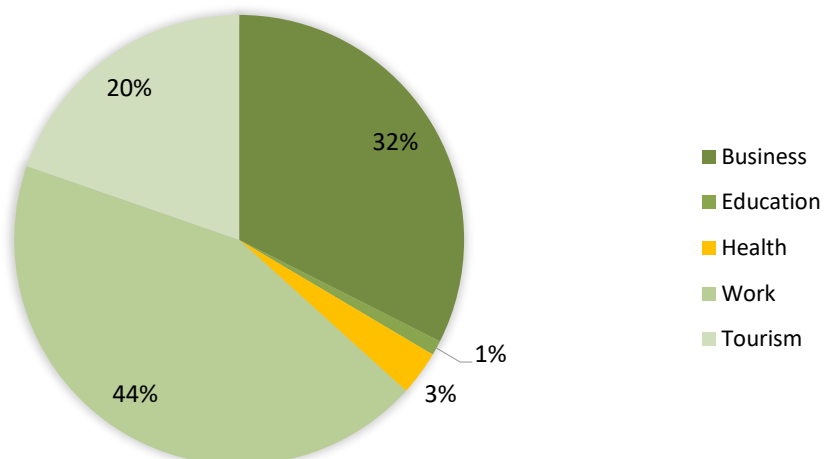


Figure 7-48: Purpose of trips from Mawtawar to Shillong

Figure 7-49 shows the percentage share of frequency of trips for the direction ‘from Shillong to Mawtawar’ at Mawlai Mawkynroh junction. As illustrated, daily, alternate day and weekly trip frequencies have percentage shares of 79%, 9% and 8% respectively.

### Frequency of trips from Shillong to Mawtawar

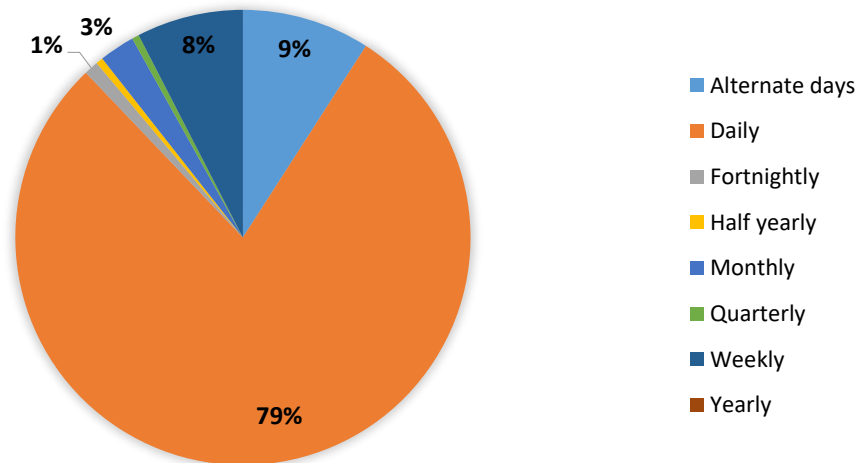


Figure 7-49: Frequency of trips from Shillong to Mawtawar

Figure 7-50 shows the percentage share of frequency of trips for the direction ‘from Mawtawar to Shillong’ at Mawlai Mawkynroh junction. As illustrated, daily, alternate day and weekly trip frequencies have percentage shares of 66%, 11% and 13% respectively.

### Frequency of trips from Mawtawar to Shillong

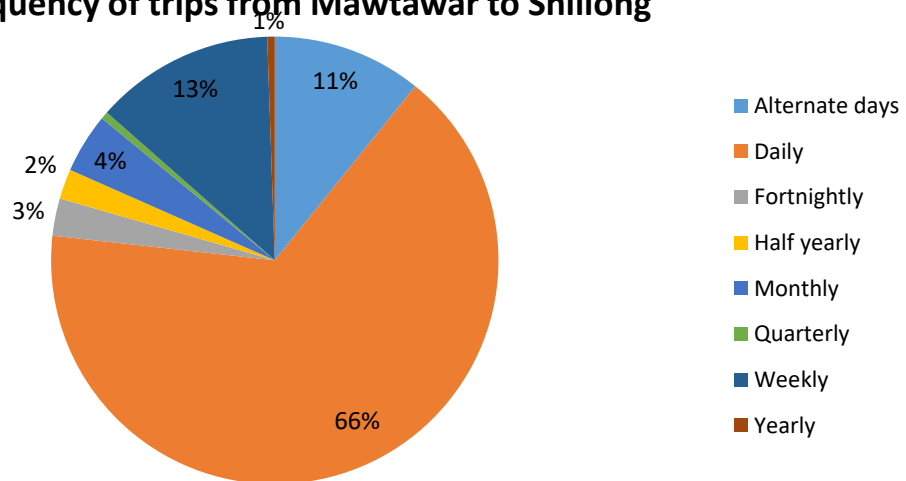


Figure 7-50: Frequency of trips from Mawtawar to Shillong

#### 7.1.7.1.3 CORDON POINT: UMSHYRPI BRIDGE (RHINO HERITAGE MUSEUM POINT)

DIRECTION: FROM SHILLONG TO CHERRAPUNJI

Calculated sample size = 937

Actual sample surveyed = 201

DIRECTION: FROM CHERRAPUNJI TO SHILLONG

Calculated sample size = 1180

Actual sample surveyed = 192

Figure 7-51 shows the mode share for the direction ‘from Shillong to Cherrapunji’ at Rhino heritage museum point. As illustrated, car, taxi, 2-wheeler and pickup truck modes of trips have percentage shares 42%, 30%, 11% and 9% respectively.

### Mode Share from Shillong to Cherrapunji

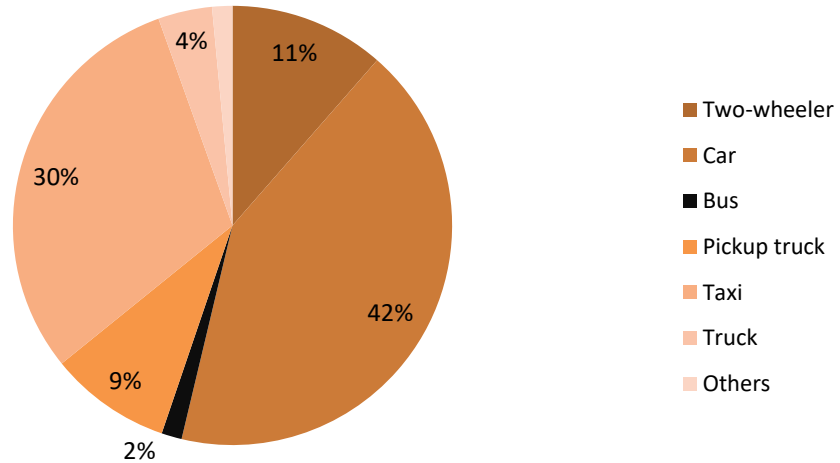


Figure 7-51: Mode Share from Shillong to Cherrapunji

Figure 7-52 shows the mode share for the direction ‘from Cherrapunji to Shillong’ at Rhino Heritage Museum point. As illustrated, car, taxi, pickup truck, 2-wheeler and truck have mode shares 27%, 38%, 14%, 9% and 9% respectively. Bus and others have minor shares of 2% and 1% respectively.

### Mode Share from Cherrapunji to Shillong

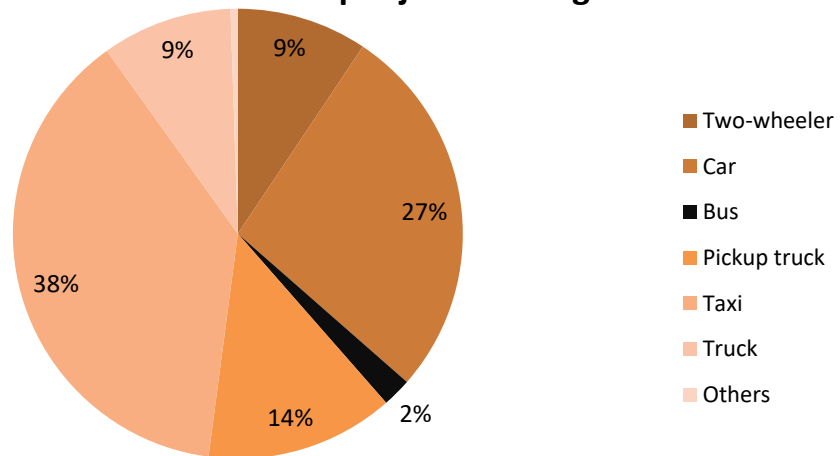


Figure 7-52: Mode Share from Cherrapunji to Shillong

Figure 7-53 shows the percentage share of purpose of trips for the direction ‘from Shillong to Cherrapunji’ at Rhino heritage museum point. As illustrated, work, business and tourism purpose of trips have 59%, 31% and 7% shares respectively.



### Purpose of trips from Shillong to Cherrapunji

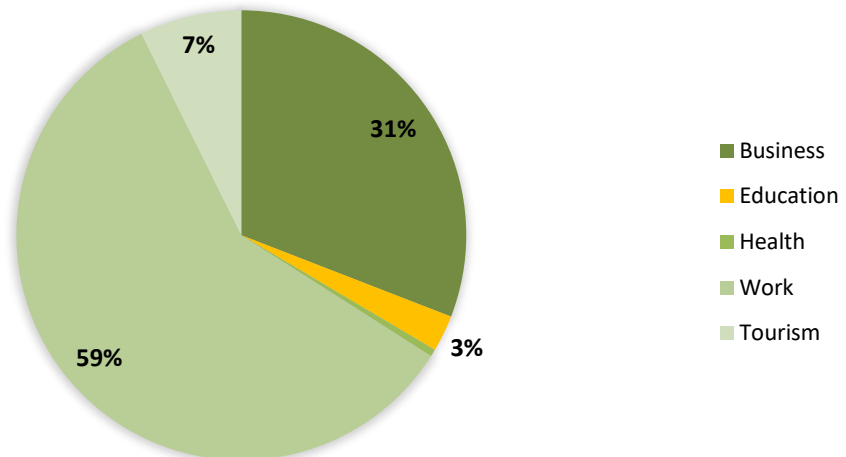


Figure 7-53: Purpose of trips from Shillong to Cherrapunji

Figure 7-54 shows the percentage shares of purpose of trips for the direction ‘from Cherrapunji to Shillong’. As illustrated, work, business and tourism purpose of trips have percentage shares 53%, 35% and 7% respectively.

It is evident that a large share of trips is related to work and business trips.

### Purpose of trips from Cherrapunji to Shillong

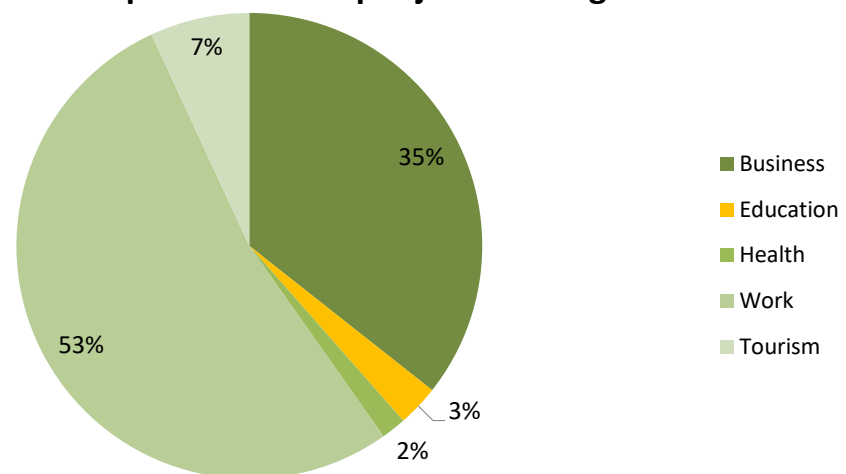


Figure 7-54: Purpose of trips from Cherrapunji to Shillong

Figure 7-55 shows the percentage distribution of frequency of trips for the direction ‘from Shillong to Cherrapunji’ at Rhino heritage museum junction. As illustrated, daily, alternate day, weekly and monthly trip frequencies have percentage shares of 65%, 6%, 15% and 9% respectively.

### Frequency of trips from Shillong to Cherrapunji

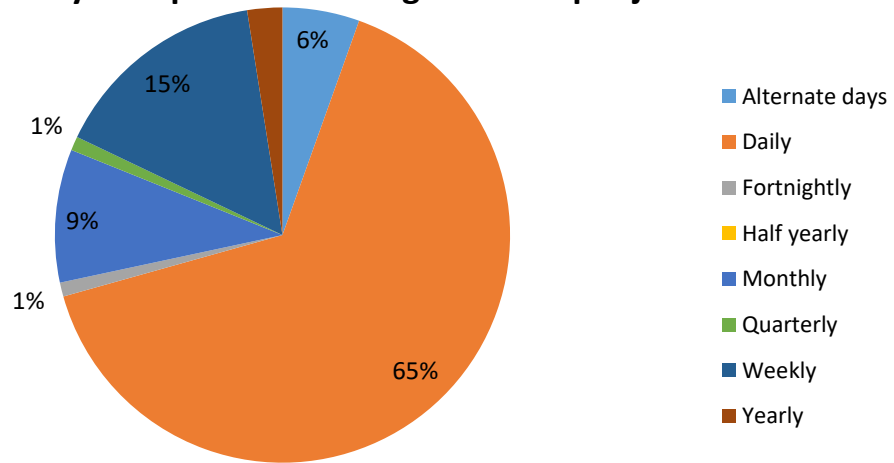


Figure 7-55: Frequency of trips from Shillong to Cherrapunji

Figure 7-56 shows the percentage share of frequency of trips for the direction ‘from Cherrapunji to Shillong’ at Rhino heritage museum point. As illustrated, daily, weekly and monthly trip frequencies have percentage shares of 71%, 24% and 3% respectively.

It is evident that daily trip frequency has the highest share among other trip frequencies.

### Frequency of trips from Cherrapunji to Shillong

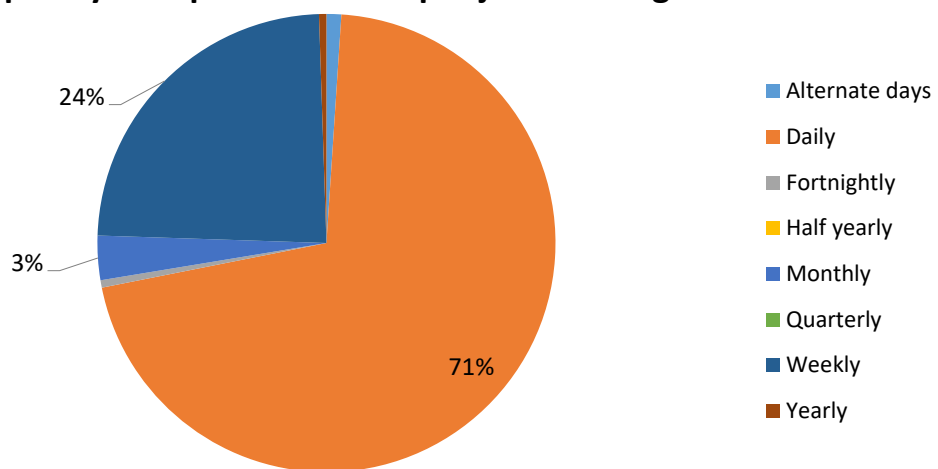


Figure 7-56: Frequency of trips from Cherrapunji to Shillong

#### 7.1.7.1.4 CORDON POINT: SAWLAD JUNCTION

DIRECTION: FROM SHILLONG TO MAWBLEI, LAITKOR

Calculated sample size = 1000

Actual sample surveyed = 218

DIRECTION: FROM MAWBLEI TO SHILLONG

Calculated sample size = 768

Actual sample surveyed = 184

Figure 7-57 shows the mode share for the direction ‘from Shillong to Mawblei’. As illustrated, car, taxi, bus, pickup truck and truck have mode shares of 40%, 32%, 14%, 9% and 4% respectively. 2-wheelers have only 1% of mode share at Sawlad for the direction ‘from Shillong to Mawblei’.

### Mode Share from Shillong to Mawblei

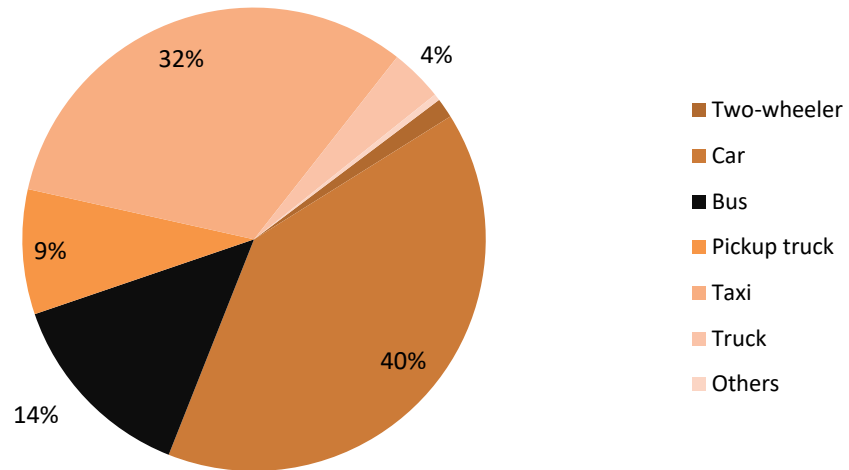


Figure 7-57: Mode Share from Shillong to Mawblei

Figure 7-58 shows the mode share for the direction ‘from Mawblei to Shillong’. As illustrated, car, taxi, bus, and pickup truck constitute most of the mode share having 39%, 31%, 17% and 10% respectively.

### Mode Share from Mawblei to Shillong

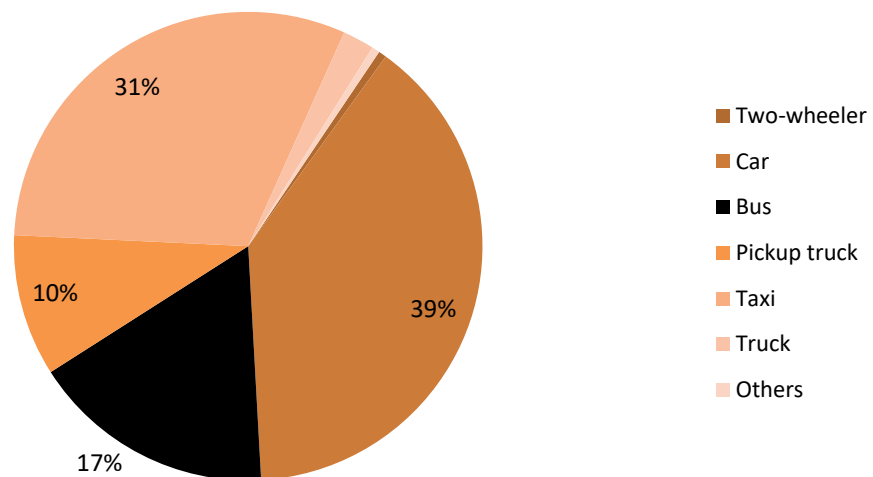


Figure 7-58: Mode Share from Mawblei to Shillong

Figure 7-59 shows the percentage share of purpose of trips for the direction ‘from Shillong to Mawblei’ at Sawlad. As illustrated, business and work have 46% and 38% shares of trip purposes respectively.

### Purpose of trips from Shillong to Mawblei

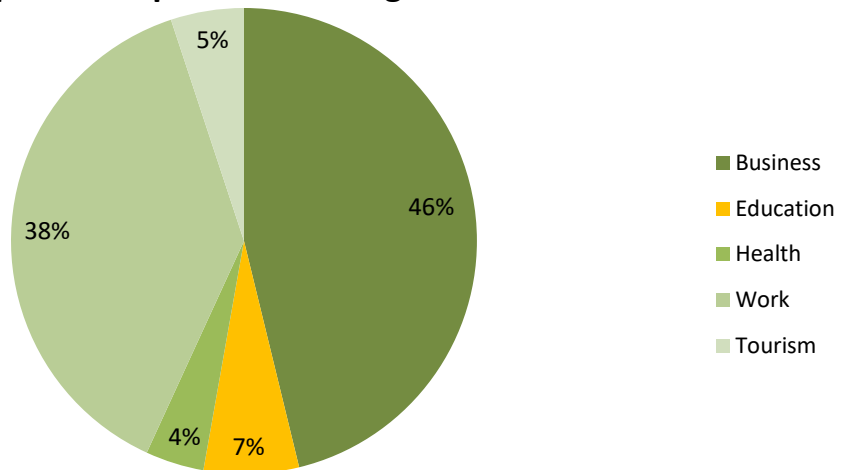


Figure 7-59: Purpose of trips from Shillong to Mawblei

Figure 7-60 shows the percentage shares of purpose of trips for the direction 'from Mawblei to Shillong' at Sawlad survey point. As illustrated, business and work have 53% and 38% share of trip purposes respectively.

It is evident that work and business trip purposes have the highest shares of trip purposes at Sawlad junction.

### Purpose of trips from Mawblei to Shillong

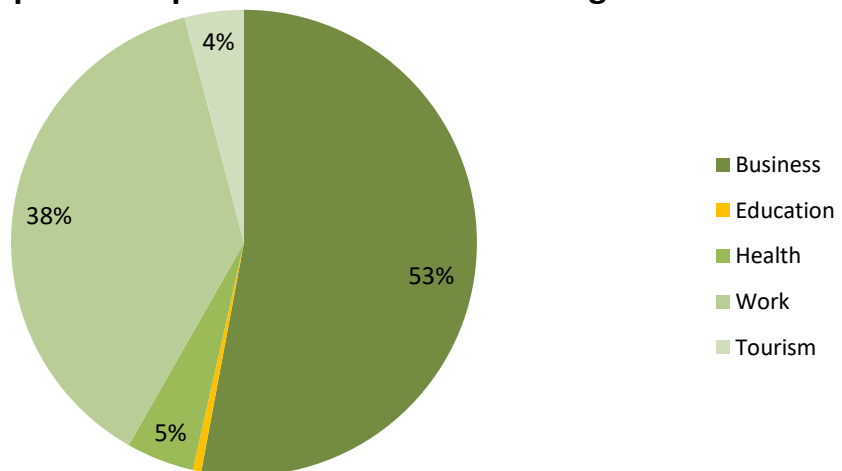


Figure 7-60: Purpose of trips from Mawblei to Shillong

Figure 7-61 shows the percentage shares of frequency of trips for the direction 'from Shillong to Guwahati' at Sawlad survey point. As illustrated, daily trip frequency has the percentage share of 68%, which is more than others are.

### Frequency of trips from Shillong to Mawblei

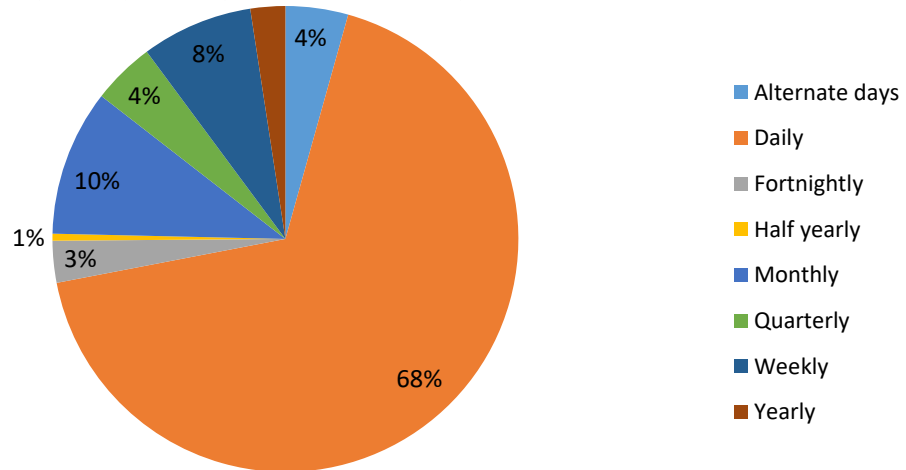


Figure 7-61: Frequency of trips from Shillong to Mawblei

Figure 7-62 shows the percentage share of frequency of trips for the direction ‘from Mawblei to Shillong’ at Sawlad survey point. As illustrated, daily trip frequency has the percentage share of 66%, which is more than others are.

### Frequency of trips from Mawblei to Shillong

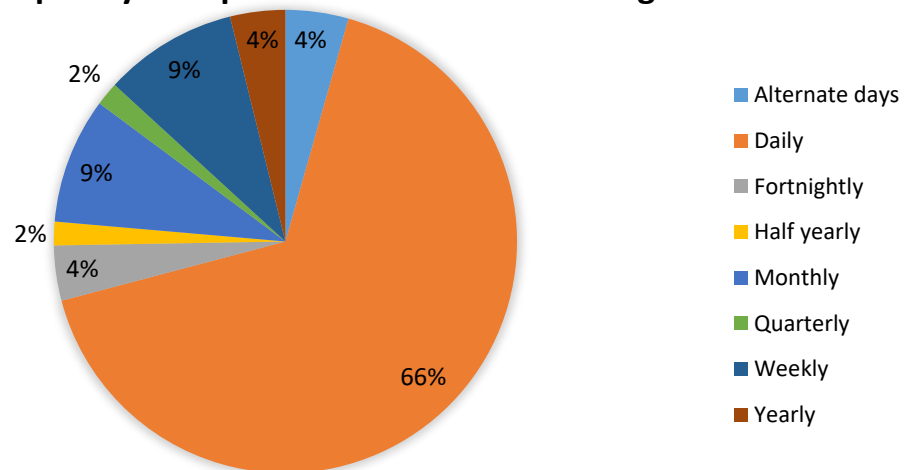


Figure 7-62: Frequency of trips from Mawblei to Shillong

#### 7.1.7.1.5 CORDON POINT: MAWKNENG (ISHYRWAT JUNCTION)

DIRECTION: FROM SHILLONG TO NEIGRIHMS

Calculated sample size = 731

Actual sample surveyed = 212

DIRECTION: FROM NEIGRIHMS TO SHILLONG

Calculated sample size = 516

Actual sample surveyed = 215

Figure 7-63 shows the mode share for the direction ‘from Shillong to Guwahati’. As illustrated, car, taxi, pickup truck and 2-wheeler constitute most of the mode share having 54%, 16%, 14% and 11% respectively.

### Mode Share from Shillong to NEIGRIHMS

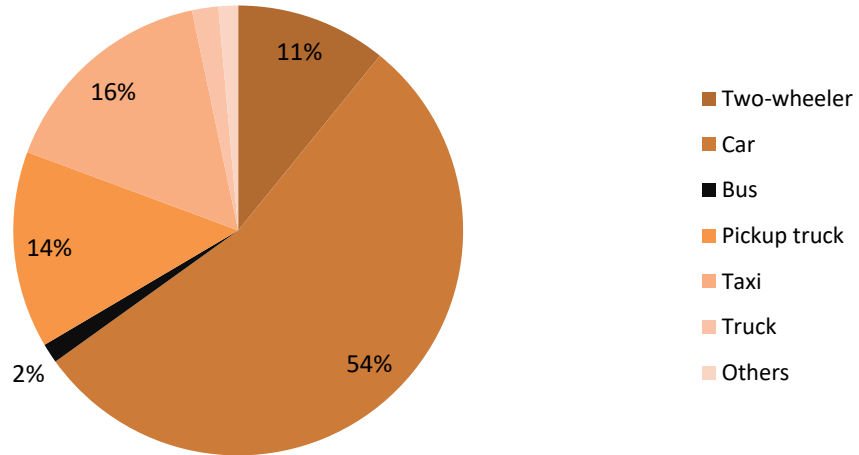


Figure 7-63: Mode Share from Shillong to NEIGRIHMS

Figure 7-64 shows the mode share for the direction ‘from NEIGRIHMS to Shillong’. As illustrated, car, taxi, pickup truck and 2-wheeler have mode shares of 54%, 20%, 11% and 9% respectively.

### Mode Share from NEIGRIHMS to Shillong

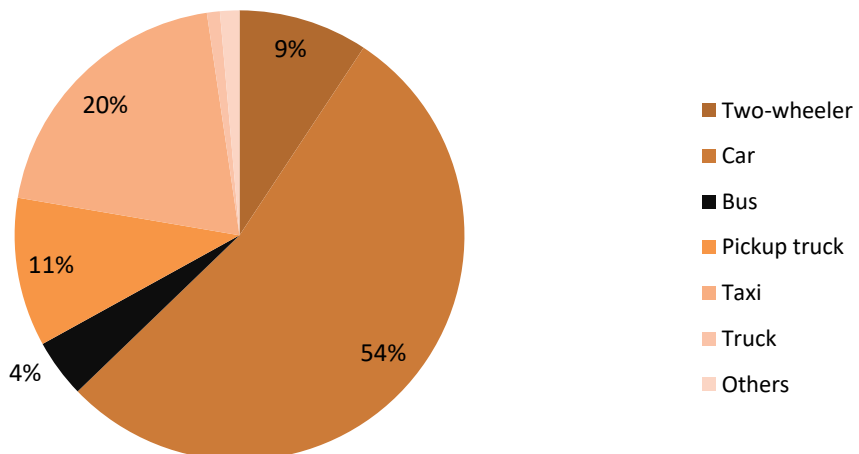


Figure 7-64: Mode Share from NEIGRIHMS to Shillong

Figure 7-65 shows the percentage share of purpose of trips for the direction ‘from Shillong to NEIGRIHMS’ at Mawkneng survey point (near Ishyrwat junction towards NEIGRIHMS hospital). As illustrated, business, work and health purposes of trips constitute almost all the share, having 19%, 67% and 14% respectively.

### Purpose of trips from Shillong to NEIGRIHMS

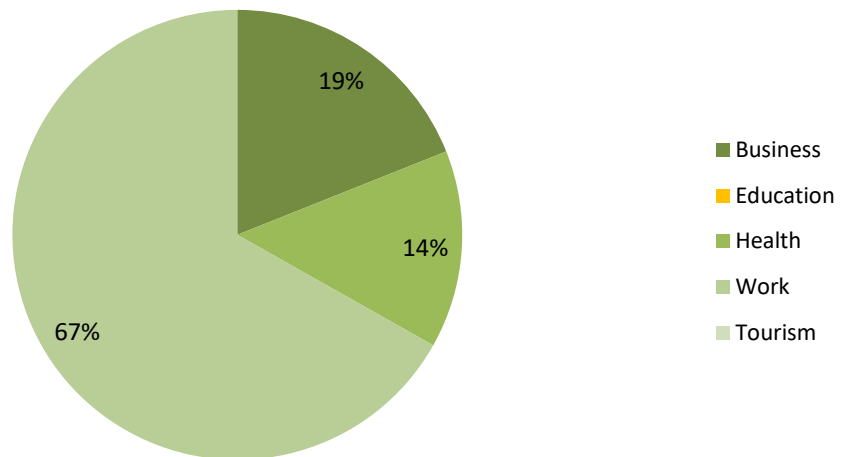


Figure 7-65: Purpose of trips from Shillong to NEIGRIHMS

Figure 7-66 shows the percentage share of purpose of trips for the direction ‘from NEIGRIHMS to Shillong’ at Mawkneng survey point (near Ishyrwat junction towards NEIGRIHMS hospital). As illustrated, business, work and health purposes of trips constitute almost all the share, having 27%, 55% and 16% respectively.

It is evident that trips related to health purpose have considerable share because of NEIGRIHMS hospital.

### Purpose of trips from NEIGRIHMS to Shillong

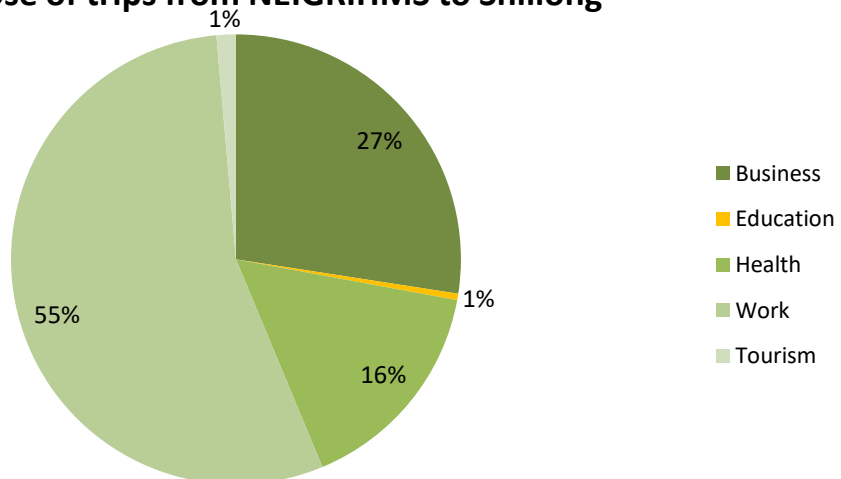


Figure 7-66: Purpose of trips from NEIGRIHMS to Shillong

Figure 7-67 shows the percentage share of frequency of trips for the direction ‘from Shillong to NEIGRIHMS’ at Mawkneng survey point (near Ishyrwat junction towards NEIGRIHMS hospital). As illustrated, daily, alternate day, weekly and monthly trip frequencies have percentage shares of 65%, 3%, 17% and 6% respectively.

### Frequency of trips from Shillong to NEIGRIHMS

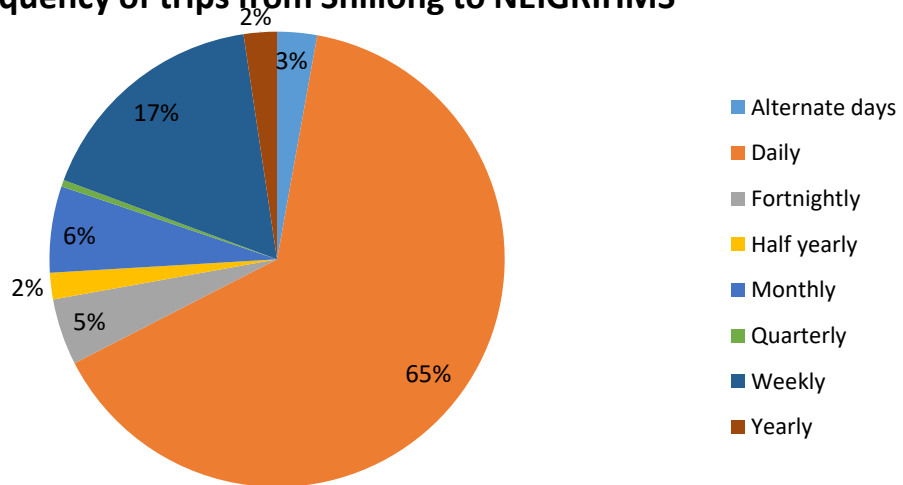


Figure 7-67: Frequency of trips from Shillong to NEIGRIHMS

Figure 7-68 shows the percentage shares of frequency of trips for the direction ‘from Guwahati to Shillong’ at Mawkneng survey point (near Ishyrwat junction towards NEIGRIHMS hospital).

As illustrated in the figure, daily, alternate days, weekly and monthly trip frequencies have percentage shares of 65%, 3%, 14% and 12% respectively.

It is evident that many trips are made daily through Mawkneng survey point.

### Frequency of trips from NEIGRIHMS to Shillong

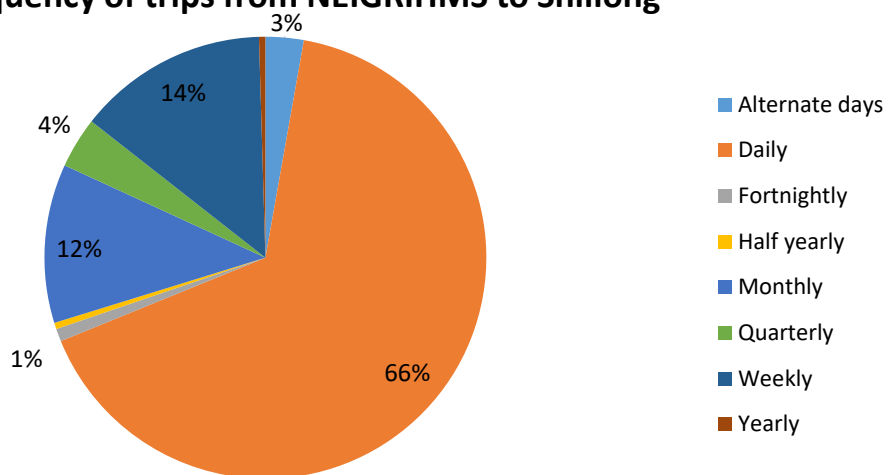


Figure 7-68: Frequency of trips from NEIGRIHMS to Shillong



### 7.1.8 ORIGIN-DESTINATION TRAFFIC FLOW

From the O-D survey, it has been observed that Lewduh area has the highest number of produced and attracted trips. Approximately 11.28% trips are produced and 11.53% trips are attracted in Lewduh area. Following *Table 7-17* shows the top 30 locations, which have higher percentage of produced and attracted trips than the other O-D locations.

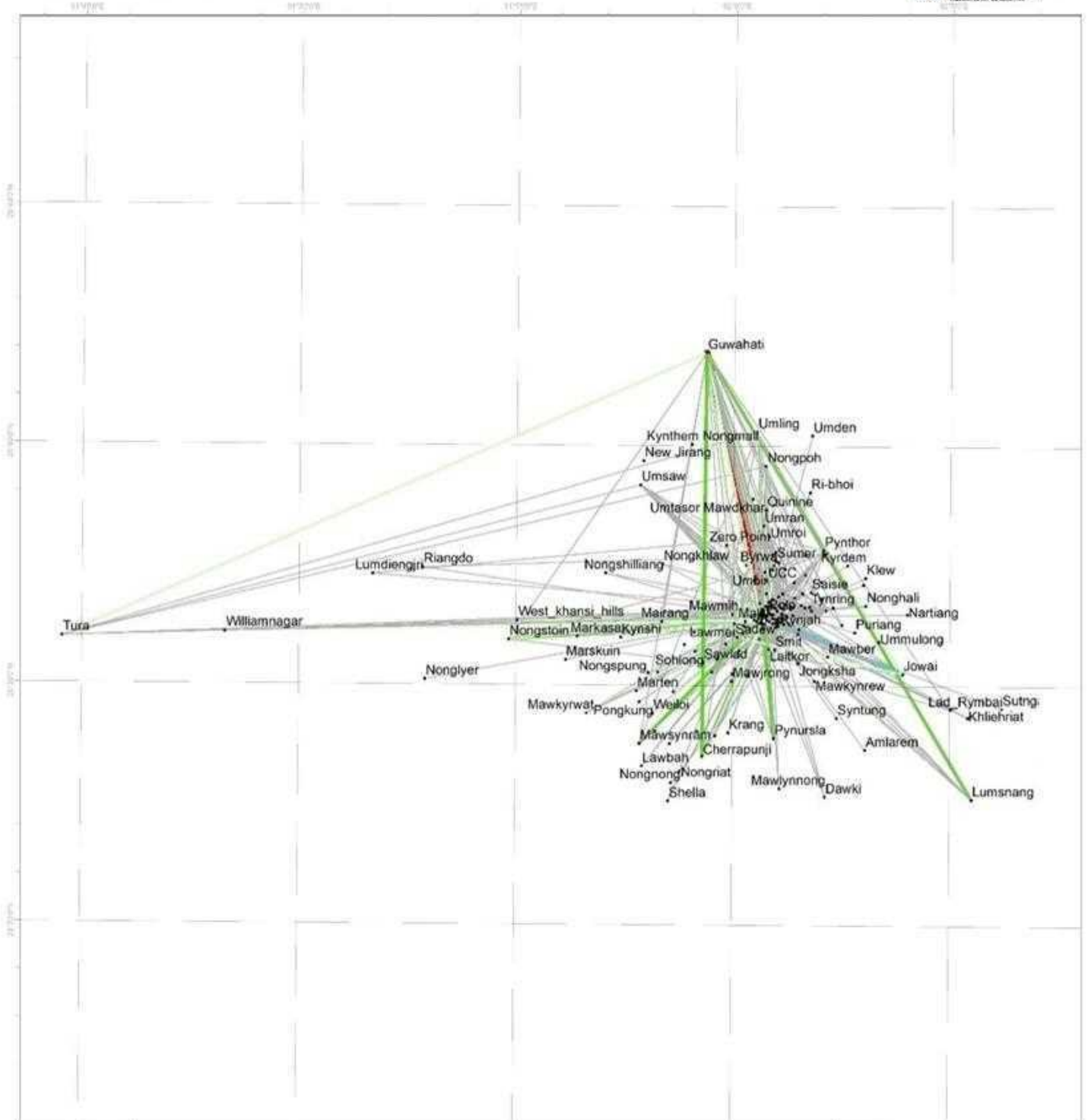
In addition, from the O-D survey, it has been observed that total trip percentage by-passable to Greater Shillong Planning Area is approximately 8.42%.

**Table 7-17: Top 30 Locations Having Higher Productions and Attractions than Others**

Location	Total Production	% Production	Location	Total Attraction	% Attraction
Lewduh	7036	11.28	Lewduh	7190	11.53
Police Bazaar	6717	10.77	Guwahati	5202	8.34
Guwahati	4384	7.03	Police Bazaar	4610	7.39
Demseiniong	2766	4.43	NEIGRIHMS	3259	5.22
NEIGRIHMS	2746	4.4	Demseiniong	2440	3.91
Mawlai	2037	3.27	Jowai	1786	2.86
Happy Valley	1883	3.02	Cherrapunji	1563	2.51
Lachumiere	1739	2.79	Mawlai	1527	2.45
Laitumkhrah	1571	2.52	Lachumiere	1267	2.03
7th Mile	1235	1.98	Nongstoin	1267	2.03
Laitkor	1108	1.78	Happy Valley	1246	2
Umroi	1044	1.67	Laitumkhrah	1170	1.88
Laban	1012	1.62	Madanriting	1135	1.82
Jowai	1005	1.61	Mawblei	1027	1.65
Mylliem	919	1.47	Mawlai Mawtawar	996	1.6
Mawblei	898	1.44	Pynursla	924	1.48
Nongthymmai	797	1.28	Laitkor	892	1.43
Garikhana	786	1.26	Sadew	827	1.33
Lummawbah	778	1.25	Garikhana	761	1.22
Nongmynsong	751	1.2	Smit	759	1.22
Mawlai Mawtawar	717	1.15	Mylliem	739	1.18
Mothphran	678	1.09	Nongmynsong	726	1.16
Madanriting	665	1.07	Mairang	700	1.12
Mawsynram	652	1.05	7th Mile	695	1.11
Umpling	648	1.04	Nongthymmai	691	1.11
Cherrapunji	618	0.99	101 Area	648	1.04
Lumsnang	613	0.98	Mawngap	648	1.04
Demthring	581	0.93	Sawlad	639	1.02
Mawpat	484	0.78	Polo	544	0.87
Umlyngka	479	0.77	Mawphlang	526	0.84

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA

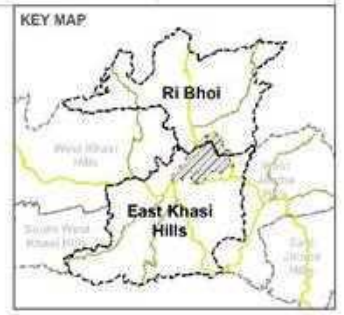
DESIRE LINE DIAGRAM



- Legend**
- Baseline Info.**
- National Highway
  - State Highway
  - Bypass
  - Major District Road

- Administrative Boundary**
- District Boundary
  - Planning Boundary
  - Planning Area Boundary
  - Planning Districts

- Number of Trips**
- 7.00 - 100.00
  - 101.00 - 500.00
  - 501.00 - 1000.00
  - 1001.00 - 1500.00
  - 1501.00 - 2000.00
  - 2001.00 - 5200.00



Scale - 1:100,000

0 1.25 2.5 5 Kilometers



Figure 7-69: Desire Line Diagram

### 7.1.9 PARKING SURVEY

In Shillong, both on-street and off-street parking locations are available but on-street parking locations are widespread in the city. These on-street parking locations are responsible for the traffic congestion on the roads. Out of these on-street parking locations, some locations are legal and some are illegal where people park their vehicles when it is required.

For finding out the parking characteristics in the city, parking surveys were conducted for both parking types i.e. on street and off-street parking locations (*Table 7-18*).

Table 7-18: Parking Locations in SPA

SNo	Parking Location	SNo	Parking Location
1	MUDA PB (Ground Floor)	28	PHE to Mbose (Off-Street (Sylvan House))
2	MUDA (First Floor)	29	PHE to Mbose (On-Street)
3	MUDA (Second Floor)	30	Jhalupara Roadside Parking (On-Street)
4	Mawkhar	31	Back of AG Office to Near SBI IGP Branch
5	Opposite SBI Parking Lot	32	All India Radio to Mizo Church
6	City Dhaba	33	St Anthony's College to Shillong College
7	Laitumkhrah	34	Shillong College to St Mary's College
8	Anjali to Barabazar	35	Behind Governor's House
9	Dreamland Arcade	36	Don Bosco Square to Pomdngiem
10	Thembijoy	37	Don Bosco Square to Christ King College
11	Opposite Hanuman	38	Ward's Lake (Pinewood Junction to Botanical Garden)
12	Malki to Seven Set Road	39	Botanical Garden to BJP Bhavan
13	Bishnupur	40	Ward's Lake (Police Point Laitumkhrah Junction to AG Quarter New Colony to Botanical Garden)
14	Red Cross	41	Garikhana to Badabazar
15	MTC	42	Barik (PHE to JNV Regional Office)
16	Mawkhar to Garikhana	43	IGP ICICI Bank to Center Point
17	Garikhana Parking Lot (Bottom)	44	AG to Barik
18	Garikhana Parking Lot (Top)	45	Keating Road to Police Bazar
19	Pine Mount	46	POLO
20	Pine Mount (Bharat Scouts And Guide)	47	Near SP Office
21	Pine Mount (Laban Sports Club)	49	Barik Transport Office
22	PHE to Mbose (Phe Main Building)	50	lew Laitumkhrah Parking Lot

23	PHE to Mbose (Off-Street (Mbose))	51	Nehu Stand
24	PHE to Mbose (Off-Street (Forest Officer))	52	Iew Laitumkhrah Parking Lot
25	PHE to Mbose (Off-Street (Environment Impact Assessment))	53	Polo Tower Stand
26	PHE to Mbose (Off-Street (Directorate Of Information))	54	Don Bosco Square to Police Point
27	PHE to Mbose (Off-Street (Executive Engg PHE))	55	Polo to Fourth Furlong
		56	Mahavira Park

### 7.1.9.1 RESULTS AND ANALYSIS

#### 7.1.9.1.1 PARKING VOLUME

Parking volume is the total number of parked vehicles during parking survey time. In Shillong city, more vehicles are parked on the road from Anjali petrol pump to Bara bazaar as shown in *Figure 7-70*.

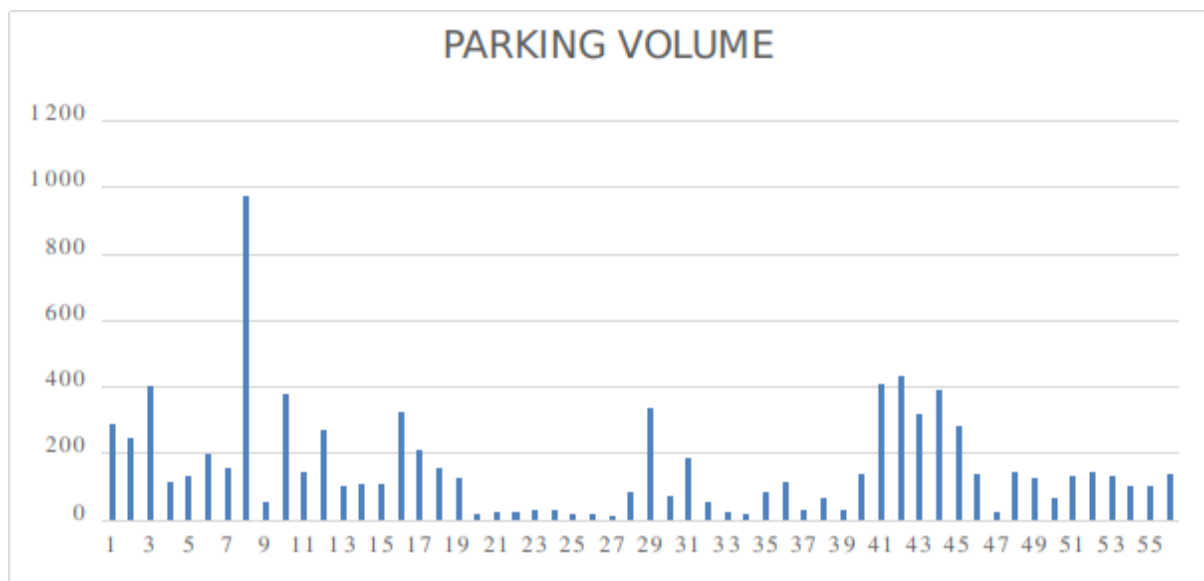


Figure 7-70: Parking Volume Distribution for Paring Locations in SPA

#### 7.1.9.1.2 AVERAGE TURNOVER

Average turnover is measured in vehicles parked per hour per bay in the parking areas. If vehicles are parked for longer duration, parking turnover will be less like in case of most of the on street parking areas where vehicles are parked and leftover for longer duration. Opposite to this, if vehicles are parked for short duration of time, parking turnover will be more as in the case of taxi parking areas where vehicles are parked only for getting passengers (*Figure 7-71*).

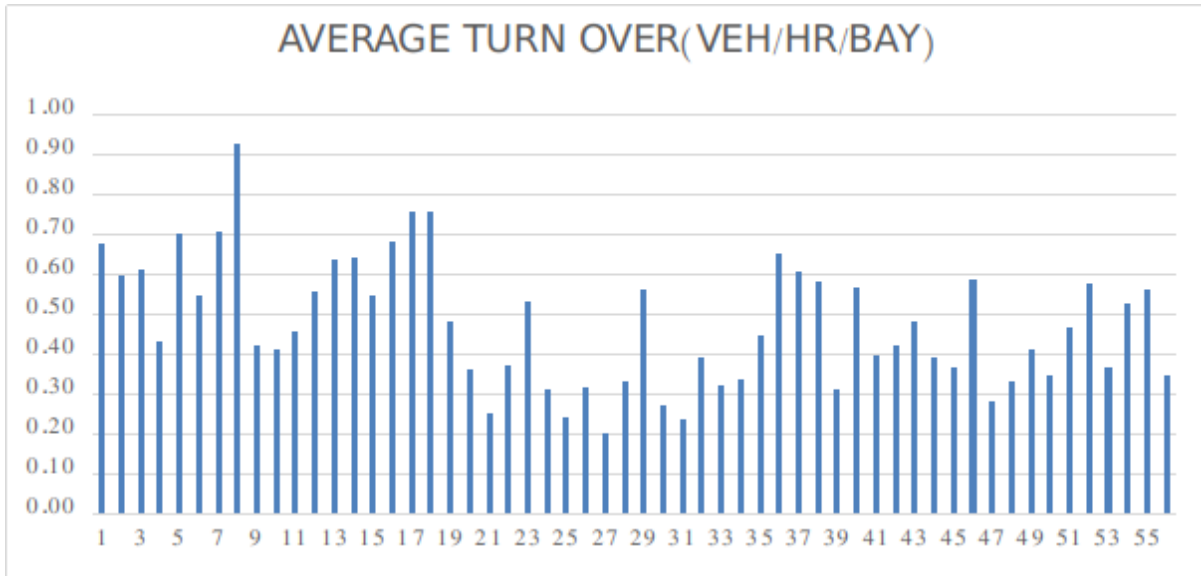


Figure 7-71: Average Parking Turnover for Paring Locations in SPA

### 7.1.9.1.3 AVERAGE PARKING DURATION

Average parking duration is the time for which the vehicle is parked on the parking bay. Average parking duration for most of the parking locations in Shillong city is more than 60 minutes as shown in *Figure 7-72*. Average parking duration can be used to decide parking charges for the parking areas and policy formation for the future.

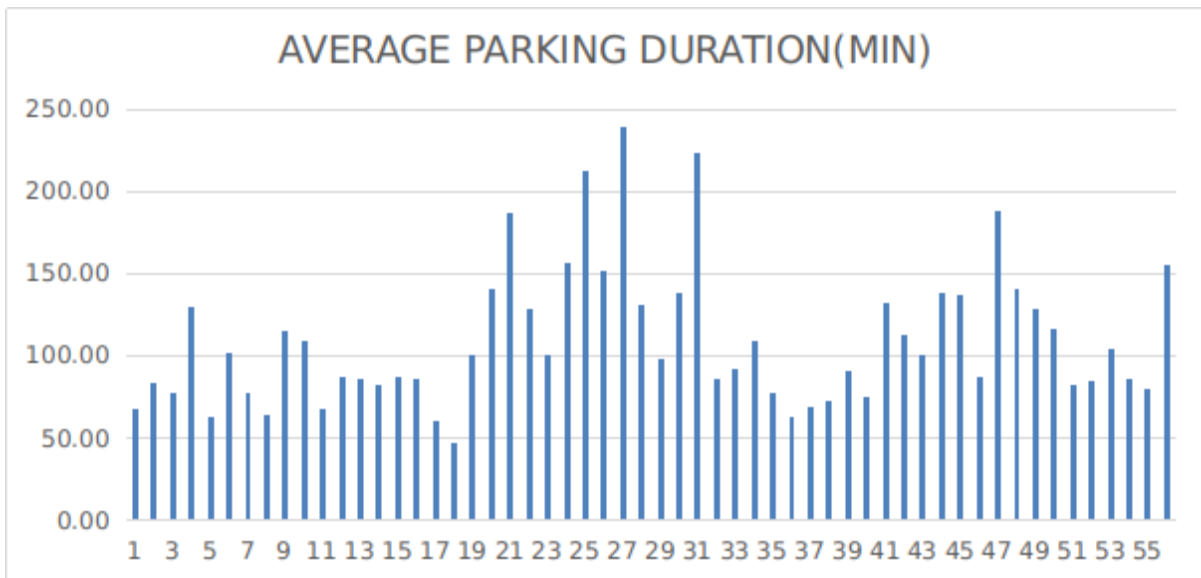


Figure 7-72: Average Parking Duration for Paring Locations in SPA

### 7.1.9.1.4 PARKING INDEX

Parking index shows the occupancy of the parking lot. If parking index is more than 85%, more parking space should be provided for smooth parking operations. In Shillong city, many parking locations have parking indices more than 85% as shown in *Figure 7-73*. These

parking locations should be considered for improvement otherwise traffic congestion and other problems would become more serious than the present condition in the city.

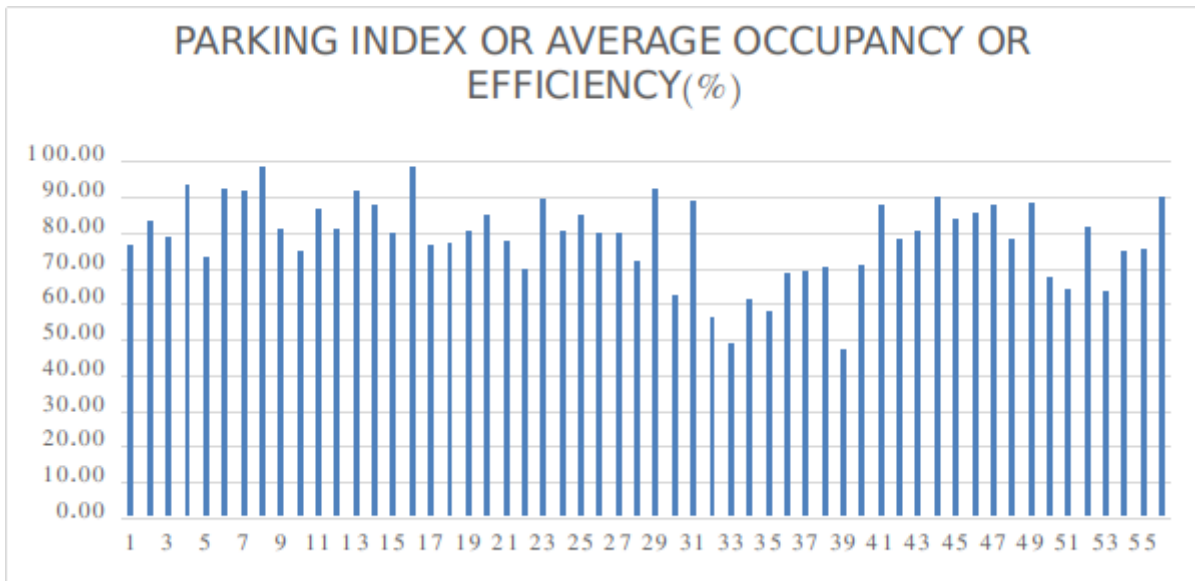


Figure 7-73: Parking Index for Paring Locations in SPA

## 7.2 PROPOSALS

### 7.2.1 CABLE CARS

Cable cars can be used for tourism as well as mass transit. It will be a relief for the city, which is already very congested, and there is no land available for the expansion of roads inside the city. The number of vehicles in the city is increasing exponentially and yet many commuters who do not own any vehicles face problems finding local cabs and buses. In many countries, ropeways or cable cars have been used for the mobility of the local commuters of their cities. Many Indian states have started ropeway services for tourism purposes.

For hilly cities like Shillong, cable cars can prove to be an asset to the city as the traffic congestion on the roads are very high, there is unavailability of land to expand roads and due to narrow roads with winding slopes, construction of flyovers are not possible. Therefore, a shift from private to public mode of transport and a shift from road to air are imperative for the city to relieve the citizens from hour-long traffic congestions. The hilly terrain of the city will be an advantage for the ropeways as gravity could be used to transport the cable cars. Gravity ropeways are an inexpensive and easy means of transportation, which operates on gravitational force without using other external power. This form of urban public transport can be accessed in any difficult terrain and can transport 10,000 passengers per hour.

**PHASE 1 (GREEN LINE):** Connecting Golf link-Polo Market-Police Bazar- Secretariat Hill- Lady Hydari Park- Dhankheti- Nongthymmai (Figure 7-74).

**PHASE 2 (ORANGE LINE):** Laban- Barik (Lady Hydari Park); Laban- Police Bazar; Laitumkrah- Polo Market; Laitumkrah- Police Bazar; Laitumkrah- Nongthymmai, Nongthymmai – Umpling, Umpling-Nongmynsong, Mawlai Mawtawar - Nongmynsong.

Each starting station will have a Foot over Bridge (FOB) for easy access into the cars. The foot over bridge will also run across the road. The FOB connected to a platform for the cable cars will also provide the cars with elevation that is beneficial for its mechanism.

The government of Meghalaya has earmarked a cost of Rs. 84 crore for the construction of Ropeways in the state. New strategies are coming up for popularizing ropeways in the state.

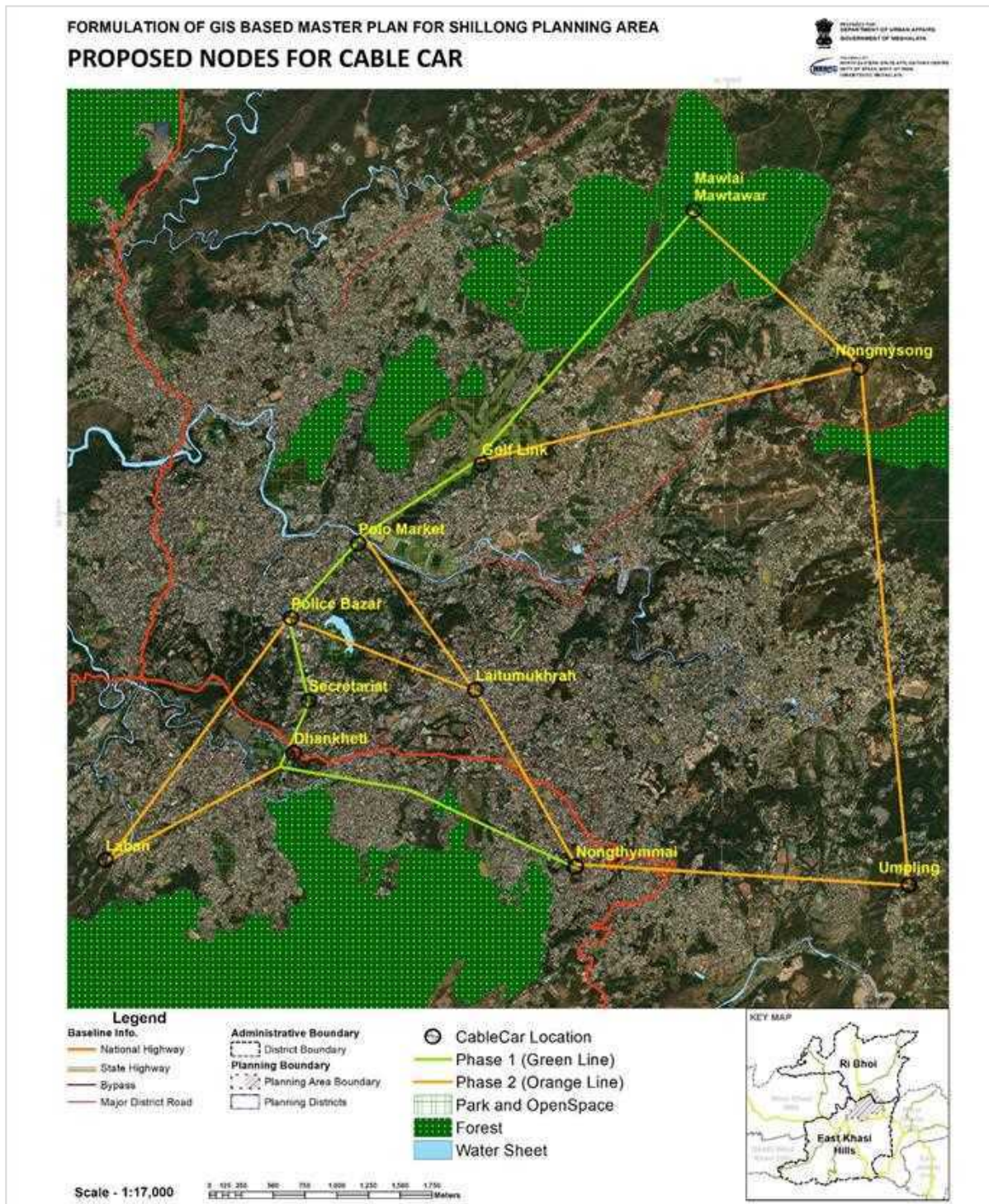


Figure 7-74: Proposal Nodes for Cable Car

## 7.2.2 COLD STORAGE/ WARE HOUSES/ MANDI/ FARMER’S MARKET

There are a lot of traffic coming from the farms in Upper Shillong and beyond into the city which adds to the traffic blockage. The traffic congestion of NH 40 that passes through Myllem witnesses congestion from Rilbong point all the way up to Myllem. A large portion of the traffic is due to small trucks and yellow sumo’s carrying farmers and their produce from the farms to the markets of Shillong.

To avoid this congestion, a vegetable mandi or a farmer’s market is proposed at Nongpyiur beside the highway so that farmers can sell their produce there and avoid going to the city. This will reduce the time and distance of the farmers and may prove to be economically viable for them.

This market will have cold storages, warehouses and dedicated area for embarking and disembarking goods along with toilet facilities, drinking water facilities, streetlights, street furniture like benches and dedicated spots for makeshift stalls. Cafes and restaurants can also be started here that offers farm fresh organic food/ breakfasts on some selected days of the week. This farmer’s markets will open up other economic sources for many locals of the area. A small parking will also be provided. A similar facility is also proposed at Ladsmit to cater traffic from Sawlad entry point.

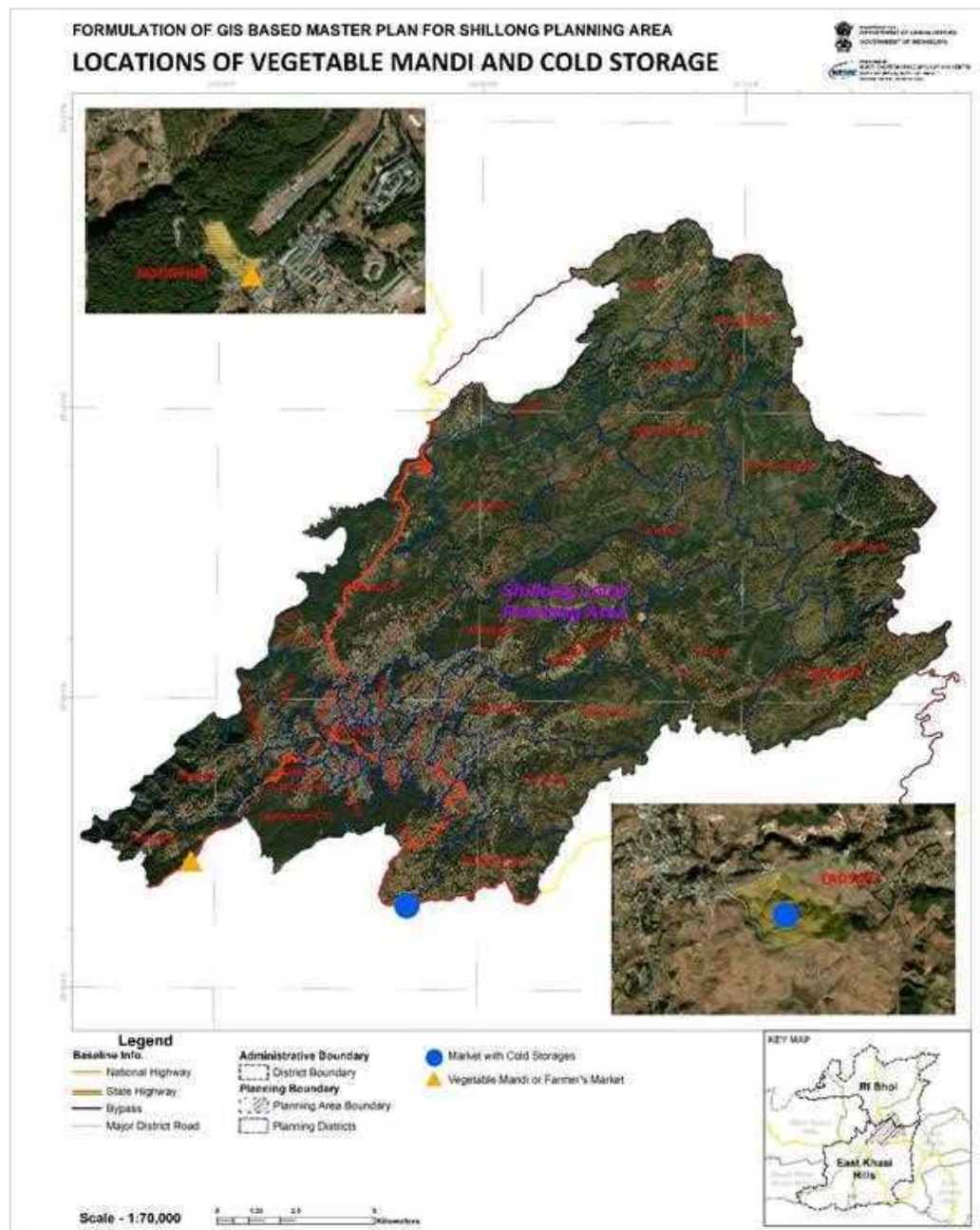


Figure 7-75: Locations of Vegetable Mandi and Cold Storage



### 7.2.3 PARKING IN SECRETARIAT HILL

The present Secretariat Hill will provide a relief to the city once the administrative units are moved out of the city and the area is decongested. Along with open public spaces for interaction and commercial zone, space for parking will also be provided where at any given time 1440 vehicles or 1080 vehicles (4 wheelers) can be parked.

The total area of secretariat hill- Approx. 0.06 sq.km (60000sq.m)

- **Option 1**

**40% of the area- Parking Space i.e. 0.024 sq.km (24000 sqm) - (justify why 40% of the area can be given to parking space)**

25% of the parking space to be kept for circulation space i.e., 6000 sqm for circulation space

Therefore, parking space is **18000 sqm**

One car requires a parking space of 2.5mX 5.00m i.e., 12.5 sqm

At any given time, **1440 cars** can be parked at the new secretariat parking space (open).

- **Option 2**

**30% of the Secretariat Hill space is converted into, open parking space then**

**30% of the area- Parking Space i.e. 0.018 sq.km (18000 sqm) - (justify why 30% of the area can be given to parking space)**

25% of the parking space to be kept for circulation i.e. 4500 sqm for circulation space

Therefore, parking space is **13500 sqm**

One car requires a parking space of 2.5mX 5.00m i.e., 12.5 sqm

Therefore, at any given time, **1080 cars** can be parked. The parking lot in Police Bazar (three floors) has a capacity of 215 numbers of vehicles.

The rest of the space, which is approximately 0.042sq.km (42000 sqm or 4200ha), will be developed as commercial zone consisting many formal and informal units and open interactive spaces for the citizens. This space would have dedicated zones for hawkers as well as permanent shops/ stores. Food trucks and food carts will be given dedicated zones along with street furniture like benches, solar powered street lights, water ATMs, dust bins, signage's etc.



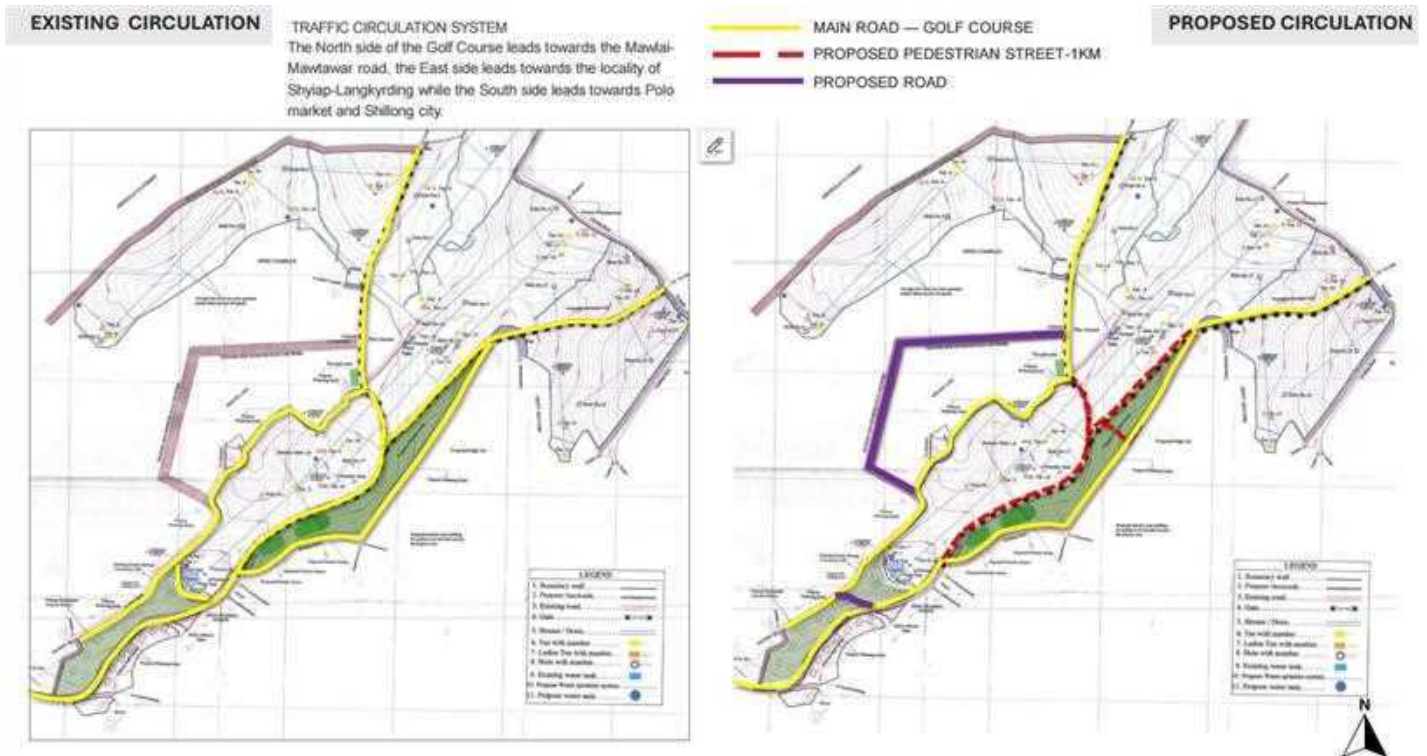
The road from the secretariat hill to Police Bazar will be prioritized for pedestrians. Movement of vehicles will be regulated on the road. The number of taxis will be reduced and mini buses will be introduced that can serve 8-10 persons at a time moving from secretariat hill to Police Bazar, Jail Road, Mothphran etc. with a frequency of 5mins.

- The road will be made pedestrian friendly that will encourage people to park their vehicles in secretariat hill and walk until police bazaar. It will cut down a large portion of the traffic and congestion eliminating travellers whose main purpose of taking the particular road is to go to Police Bazar for marketing.
- Street furniture like benches, street lightings, signage's, dustbins, water ATMs etc. will be provided along the road that nudges the citizens to walk more.
- More trees, bushes and shrubs will be planted along the road that increases the aesthetics of the road.

- The hawkers will be provided with designated spaces along the road that does not encroach the pedestrian pathways.
- Pseudo barriers on the road with bushes so that pedestrians can walk freely and safely.

### 7.2.3.1 PEDESTRIANS AT GOLF COURSE AREA

The project is divided into four components: **Farmer’s Market (2 acres)** – The project is intended to provide a space for local farmers, businessman to sell their crafts with the visitors. **Adventure and Culture park (4.5 acres)** - The project is intended to provide a public space for adventure sports like skating, wall climbing, and local events. **Public Park (4.2 acres)** - The public park is intended to people for leisure and recreation, to observe nature and a dog park is added to it. **Streetscape (1km)** - The adjacent street will be designed for pedestrians to have an enjoyable experience of walking while enjoying the beauty of the nature. The pedestrian way is shown below and also integrated in proposed land use section 12.3.16.



## 7.2.4 TRAFFIC JUNCTIONS THAT NEEDS AUGMENTATION

### 7.2.4.1 UMIAM FLYOVER

Even though at Umiyam Junction the LOS from 'Junction to Guwahati' is found out to be E, which means unstable flow, the density of traffic is not as high. There is easy flow of traffic from the junction to all three sides, which are Shillong, Guwahati and Umroi. To curb the traffic problems at the junction a flyover has already been constructed that diverts the vehicles coming from Guwahati to Umroi and vice versa.

*No augmentation is required at this junction.*

### 7.2.4.2 MAWLAI PETROL PUMP

The Mawlai Petrol Pump junction is one of the most congested junctions in the city. The Level of Service (LOS) calculated here is F at both Junction to Shillong and Junction to Guwahati, which means forced traffic flow in which the amount of traffic approaching a point exceeds the amount that can be served. The LOS at Junction to Mawlai Bus stop is E which means there is still unstable flow but the flow is not restricted.



Figure 7-76: Stretch of Flyover at Mawlai PP Junction

There is a need of a flyover at this junction or a fly over that crosses the junction. The PCU count shows the highest number of vehicle movement from Shillong to Guwahati and from Guwahati to Shillong. There is a substantial amount of movement of cars from Shillong and Guwahati to Mawlai Bus Stop as well and vice versa which causes the traffic congestion at the point as the road is narrow and the traffic needs to be stopped to let the vehicles move out from Mawlai Bus Stop to Shillong and Guwahati (Figure 7-76).

A flyover needs to be proposed that crosses this junction so that an uninterrupted movement of traffic can be maintained from Shillong to Guwahati and Guwahati to Shillong and for all the cars entering and coming out of Mawlai Bus stop and Nongkwar, they can access the present road.

This Flyover can start at 150 meters before the junction on both sides.

### 7.2.4.3 GARIKHANA JUNCTION

Garikhana is another congested junction of Shillong. Here again, the traffic is mainly due to the substantial number of vehicles coming out and going in from the National Highway to the other roads. In this case, from National Highway to Mothphran and Mawprem. The highest vehicular movement is from Shillong to Guwahati and from Guwahati to Shillong but the congestion can be avoided if there is a free flow of the movement of cars but the inconvenience is caused because of the cars coming out and going in towards Mothphran.

Another flyover should be proposed that covers this junction.

### 7.2.4.4 RILBONG JUNCTION

Rilbong Junction is again one of the most congested junctions of the city. Here the PCU recorded is one of the highest. Many cars come into the city from Upper Shillong and go out of the city in the evening. Vehicles also move from Upper Shillong towards Garikhana and similarly, many vehicles move to and from the city towards Garikhana and beyond. Congestion at this point affects the traffic of the whole city. The stretch from Garikhana to Rilbong point and until Anjalee Petrol Pump is a crucial stretch as it witnesses traffic quite often *Figure 7-77*.

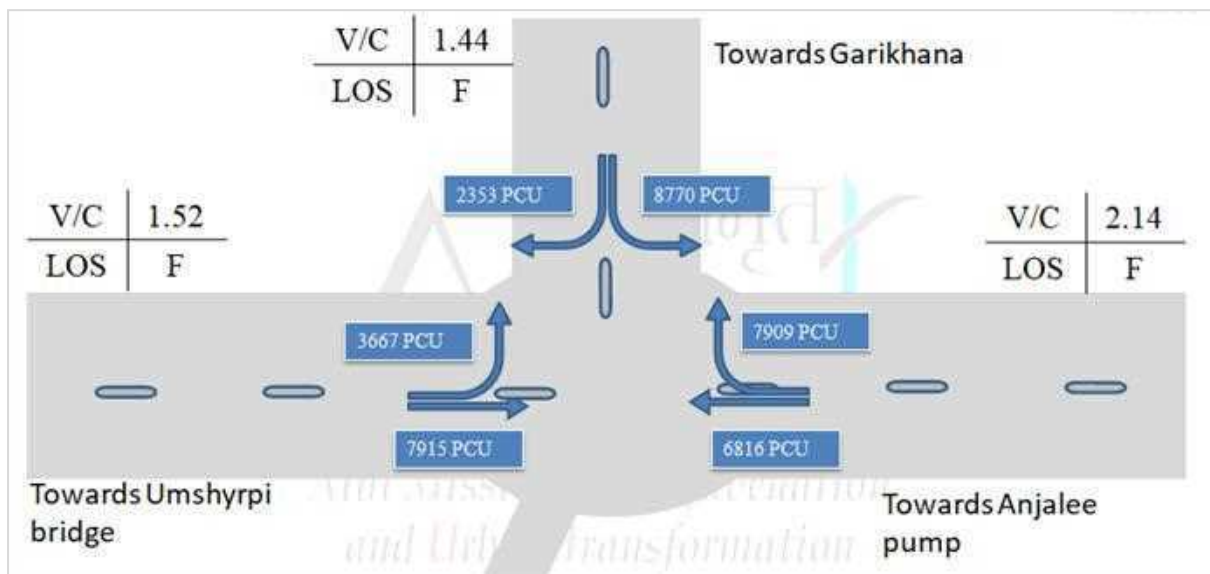


Figure 7-77: Turning Moment at Rilbong

A fly over at this junction is imperative to the city, as it will curb a lot of the congestion. The vehicles that move from Anjalee Pump towards Guwahati/ Mawlai must be given a different access so that it is not hampered by the traffic caused by the traffic flowing in from Upper Shillong.

#### 7.2.4.5 MAHAVIR PARK- RILBONG FLYOVER

A three legged Flyover starting from Mahavir Park having one end towards Umshyrpi Bridge and the other end towards Anjalee Patrol Pump is proposed. The total length of the flyover will be approximately 0.98 km starting 30 meters after Mahavir Park and continuing after Rilbong point up to 200 meters towards Anjalee petrol pump and 230 meters towards Umshyrpi Bridge.

Vehicles coming in from Guwahati or Mawlai that intends to go beyond Rilbong and vice versa can go underpass the flyover uninterrupted by the traffic that comes out from upper Shillong through Umshyrpi Bridge. Traffic coming from Guwahati or Mawlai that intends to go to upper Shillong can access the flyover and vice versa. In addition, vehicular traffic from upper Shillong towards Anjalee petrol pump can take the flyover. This arrangement would act as grade separators minimizing vehicular conflict (*Figure 7-78*).

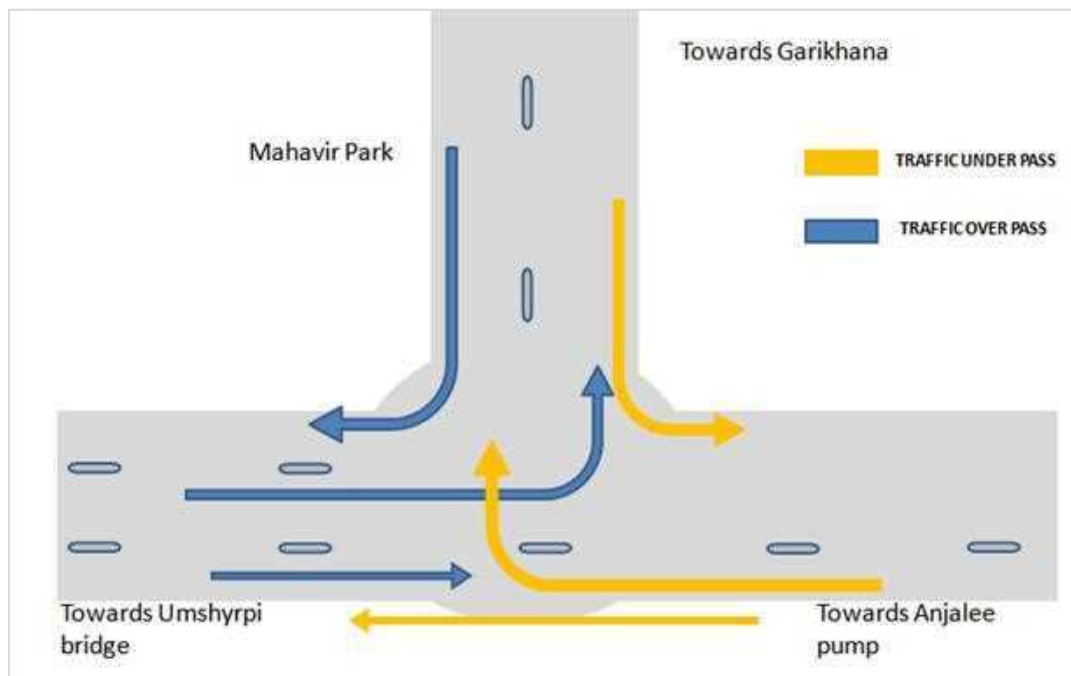


Figure 7-78: Grade Separators

#### 7.2.4.6 ONE-WAY TRAFFIC DIVERSION AT ANJALEE PETROL PUMP

The prime bottleneck for vehicular traffic continued from Rilbong point is witnessed at Anjalee petrol pump. The conflict at this point is due to intermixing of back and forth traffic haphazardly crossing each other, in the absence of a median (*Figure 7-79*).

A one-way diversion road of length 250



Figure 7-79: Diversion Road at Anjalee

meters is proposed emanating at the backdrop of Meghalaya Human rights commission. This road would act as a diversion route for the traffic coming out of Shillong city moving towards Rilbong point. Thus would be very useful in eliminating vehicular conflict at Anjalee petrol pump and improving the level of service at this junction.

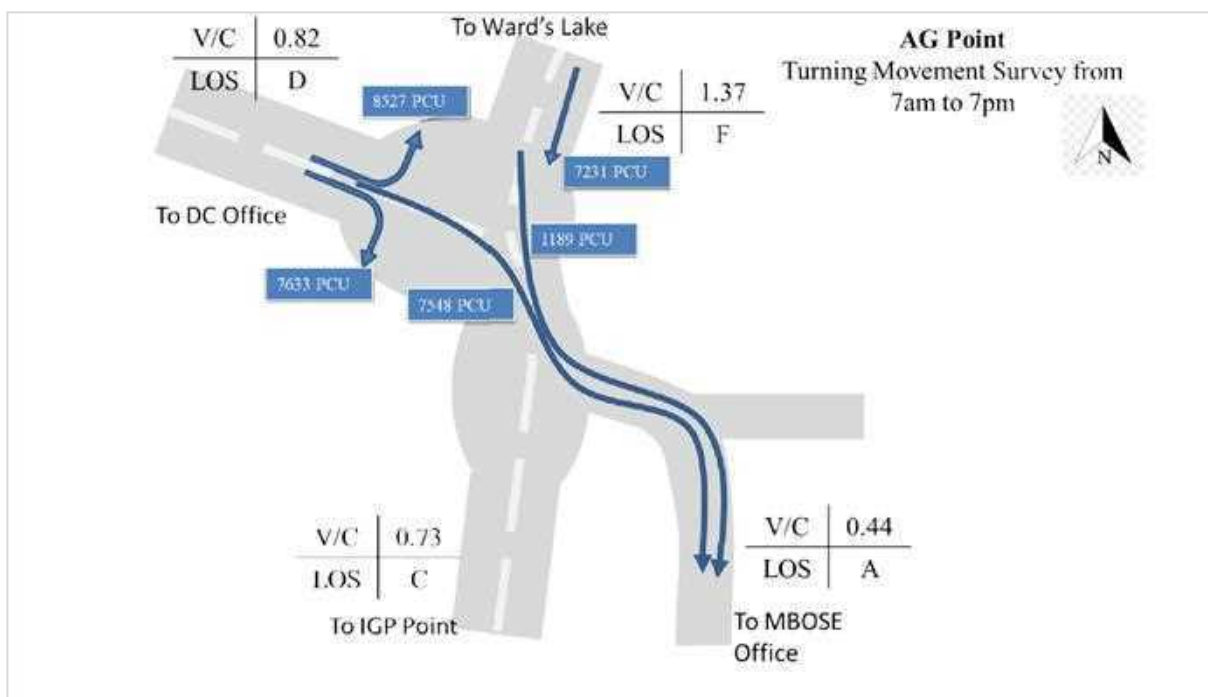
#### 7.2.4.7 AG POINT

There is usually less traffic witnessed in AG point. The traffic is mainly due to cars coming from Police Bazar and the traffic from administrative offices.

Once the administrative zone is taken elsewhere, the traffic pattern of this area will change completely. The redesign of the secretariat hill with a parking zone, open spaces and commercial zone will invite more traffic into the area and a substantial part of the traffic will terminate at this point.

At present, the LOS calculated from the Junction towards MBOSE office is A which means there is free flowing traffic. The LOS from the junction towards IGP point is C, which is a good traffic flow. The LOS from DC office to Junction is D, which shows some obstruction in the traffic flow but since it is a one way with no parking allowed on the side of the road, this stretch needs no augmentation.

The LOS measured from Ward's Lake to the Junction is F. This is mainly because there are no signals at the junction and the traffic going towards MBOSE office cuts the traffic coming out of Ward's Lakeside towards IGP point. There is a conflict at the junction between the traffic moving in three directions and mostly there are no traffic officers at the junction to handle the smooth movement of traffic.



● Conflict points

These are two conflict points at this junction

1. Traffic moving from Ward's Lake and towards IGP point is conflicted by traffic moving from DC office and towards MBOSE office or Gurudwara.
2. Traffic coming from Gurudwara or Polo and moving towards IGP point is conflicted by traffic coming down from Governor's House (includes cars from Ward's Lake and DC office) towards MBOSE office.

Signalling is required at the junction that can time the movement of the traffic especially at the conflict points.

#### 7.2.4.8 IGP POINT

IGP point is one of the widest junctions of the city and it witnesses the maximum traffic congestion from AG to PB. From AG to Barik the congestion is mostly due to peak school hours as there is a school a little ahead of the junction.

No augmentation is required on the stretch from AG to Barik as it is a one way road with fairly fast moving traffic and wide roads. There is on-side parking by the side of the road but that mostly does not hamper the traffic even though the LOS calculated in F.

There is heavy congestion from AG to PB. Even this stretch maintains a one way with adequately wide roads. The congestion is due to the traffic moving towards PB and from PB to Mothphran, which stretches until the IGP point. Again, no augmentation is required at this junction as it maintains one way and there are no conflict zones. To cater to the problem, the traffic congestion in PB and in the GS road has to be taken care of.

With the redesign of the Secretariat hill, the traffic pattern of this whole area will be affected adversely. Parking will be provided at the secretariat hill, which means a large portion of the traffic will terminate at this point. The going in and the coming out of the vehicles from the parking might create some congestion on the road at the entry and exit points.

No fly overs and signalling required at the point.

#### 7.2.4.9 MALKI POINT

Malki Point witnesses the highest traffic congestion during school and office hours. Traffic extends from Laitumkhrah to Malki Point and beyond until Barik Point. The traffic continues until Nongthymmai on some days. Many important schools and other educational institutions are on this stretch of road, which contributes mainly to the traffic. To curb the problem of traffic at this point, the congestion needs to be cleared right at Nongthymmai and Madanriting. The traffic from there extends until Malki and Barik point.



No signaling is required at the point because the only other diversions at the point are the road to seven set school, to lower Lachumiere and Upper Lachumiere. Signals might create confusion at the junction.

Pedestrian crossings should be provided.

#### 7.2.4.10 MOTHPHRAN POINT

Mothphran point is congested mainly due to the pedestrians, the taxi stands, the mixed land-use, the hawkers, vehicles embarking and disembarking at the point etc. The LOS calculated from the junction to Jaiaw and Junction to Garikhana are A. Therefore, no augmentation as such is required.

However, the junction needs to be decongested by giving dedicated zones for the hawkers and the fishmongers, cleaning the roads, earmarking dedicated space for embarking and disembarking of goods etc.

The LOS measured from Umsohsun towards the junction is C, which shows slight traffic. This is caused due to the traffic congestion at Garikhana point, which creates an impact until Mothphran junction (Figure 7-80).

Signals should be put up at this junction for maintaining an even traffic flow.

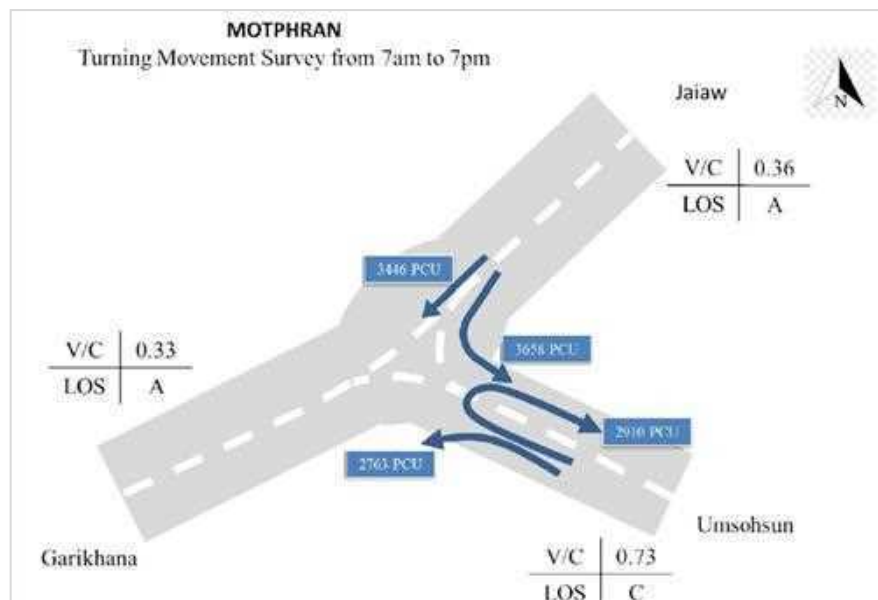


Figure 7-80: Turning Moment at Mothphran

A foot over bridge should be proposed at this location because it has a heavy pedestrian movement and if this movement is given a different route or access then it will decongest the roads to a significant level. There have been many such cases in the area and a foot over bridge will only enhance such activities in the area.

Other than a foot over bridge, the junction should be provided with solar streetlights, dustbins and other street furniture.

## 7.2.5 IMPACT OF NEW HIGHWAYS AND BY PASSES ON THE TRAFFIC OF SHILLONG

### 7.2.5.1 WESTERN SHILLONG BYPASS

The new bypass that is proposed from Umbir to Mawmaram will help curb traffic of the main city largely. Around 11% of the bypass traffic enters the city adding to the traffic jam of the city. This new bypass will act as the western bypass for the city and provide connectivity to many tourist places including Sohra, Dawki, Mawsynram, Mawkyrwat, etc. Many tourist vehicles coming for Assam for one-day tour will not have to enter the city.

### 7.2.5.2 LINK ROAD CONNECTING OLD SHILLONG AND NEW SHILLONG

The Shillong Planning Area in its core considering the agglomeration area is envisaged to undergo a major re-densification process. Wherein major future developments are proposed in and around the suburbs and fringe zones. The shifting of administrative units in the New Shillong Area would also increase vehicular footfall to ascertain daily commuting of service holders (*Figure 7-81*).

At this point, an immense need of a link road connecting Old Shillong and New Shillong Areas is felt to ease mobility and support the re-densification of Shillong Planning Area.

A link road of total length 35kms has been proposed that would act as trunk carrier for commuters to and from the New Shillong and Old Shillong Areas.

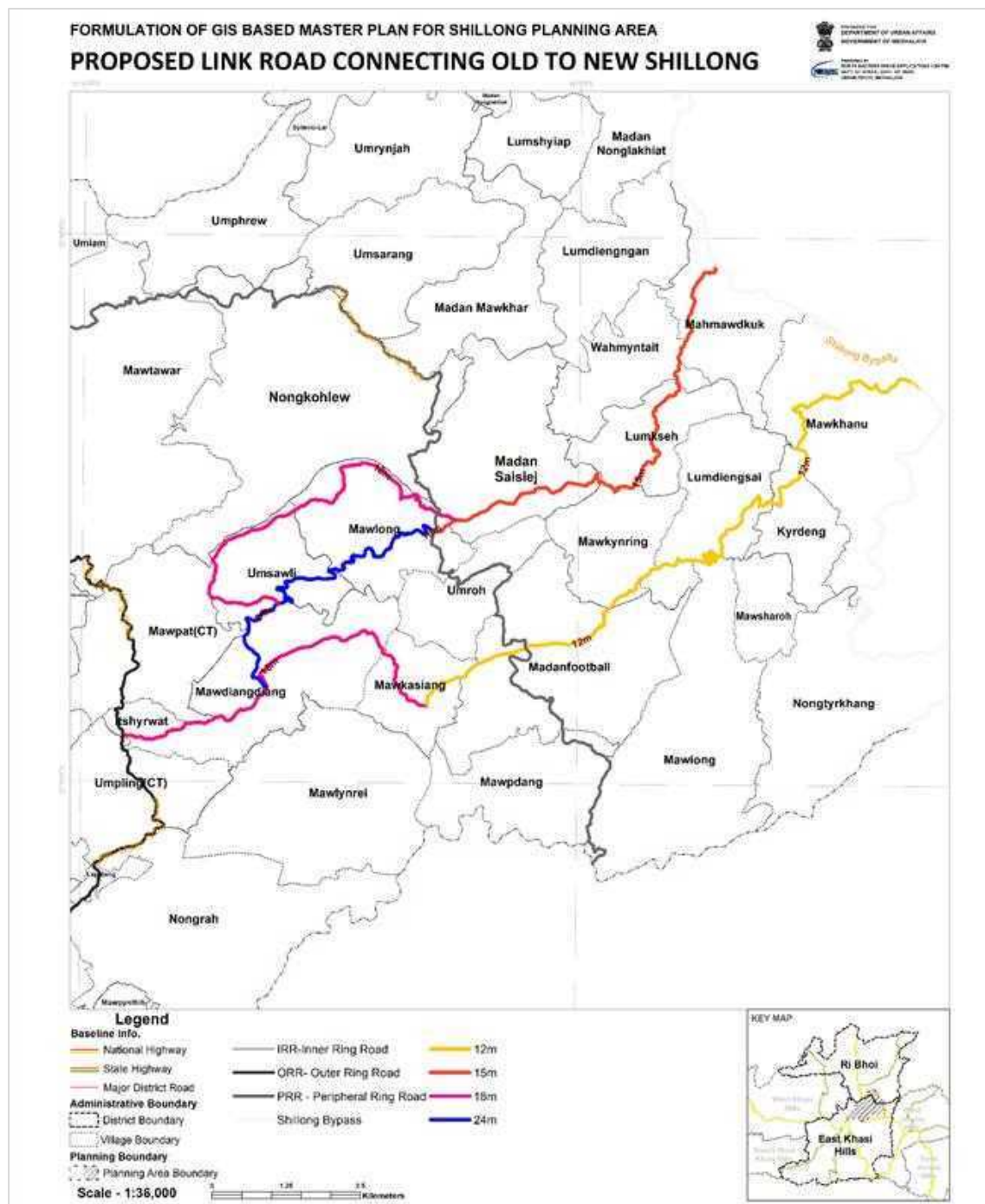
The road would start near Ishyrwat connecting via Mawdiangdiang junction to Mawkasiang having a width of 18m. Simultaneously, a road of 24m width would start from Mawdiangdiang connecting NIFT, IIM Shillong, Umsawli village, Mawlong until Madan Saisiej. From Madan Saisiej, a 15m road emanating towards proposed Outer ring road/Bypass at village Mawkhanu passing through Lumkseh, Wahmyntait and Mahmawdkuk. The total length of the road stretch is 18kms.

Alternately, the road of width 12m would start at Mawkhanu village in the New Shillong Township passing through the villages Kyrdeng, Lumdiengsai & Madan football connecting to Mawkasiang (near to the Seijiong Catholic Church). The total length of the road stretch is 17kms.

## 7.2.6 OTHER RECOMMENDATIONS

- Road safety to be taken seriously. Helmets to be worn by riders and pavilions. Seat belts must for driver and passengers sitting on the front seat
- Footpaths to be constructed at all locations with high pedestrian footfall but poor walking conditions.
- Street furniture like solar powered street lights, dustbins, benches, to be provided for nudging pedestrians to walk more.

- Pergolas can be provided at certain locations to improve the aesthetics of the streets and to encourage locals to walk more.
- Broken roads, pot holes etc. to be repaired. All drains to be kept clean and provisions to be taken to avoid water choking during monsoon.
- More buses and other public transport to be introduced with revised routes and frequent intervals.
- More green by the side of the road with bushes, plants, shrubs etc. This will shade the roads and the sidewalks making it comfortable for pedestrians to walk during summer.



- More overhead sheds on the roads to protect the pedestrians and riders during heavy rains.

### 7.2.7 PARKING

Parking issue is one of the biggest concerns of vehicle owners of the city. With the increasing number of vehicles in the city, increases the demand of parking.

Dynamic Pricing of Parking, which shall be tailored according to the demand and supply on each street.

Other recommendations

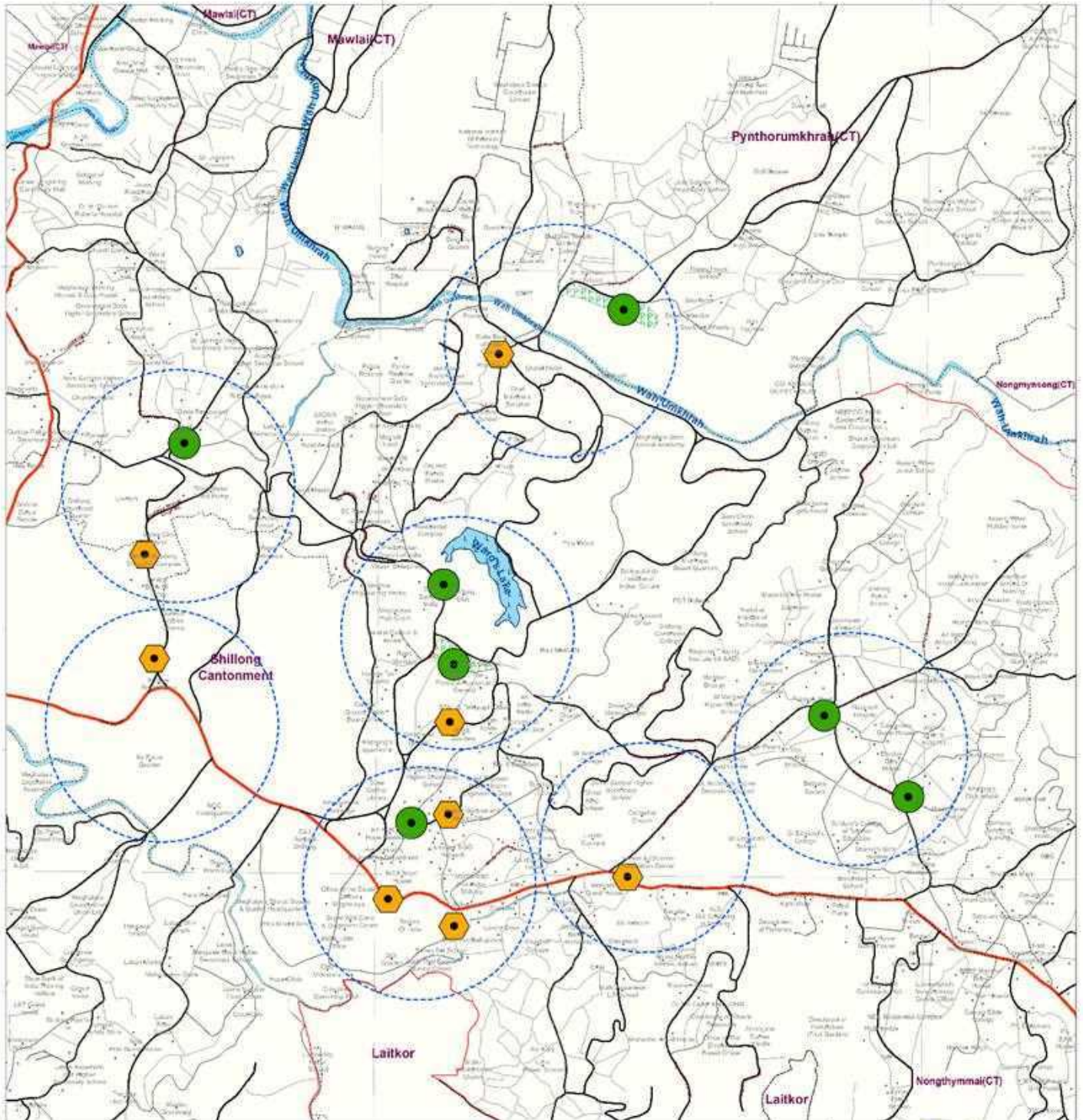
- Installation of parking sensors for on street parking.
- Some on –street parking to be charged (to be identified).
- Dedicated parking area marked for the on-street parking.
- No on street parking allowed at any road/ street with a width less than 6m.

Table 7-19 Parking Proposals

S No	Landmark/Place	Parking Types	Total Parking spaces proposed
1	Near MUDA Parking Complex, Anjalee.	Mechanical Car Parking System	35
2	Near Anjalee Gas Station		45
3	Near BSNL Office		30
4	Near Dhankheti Police Point		15
5	Near Seven Set School, Malki		25
6	Near Step By Step School, Malki		60
7	Near Presbyterian Church Of India, Lachumiere		30
8	Near Polo Tower		10
9	Mothphran		114
10	Inter State Taxi Stand, Police Bazar.	Multi-level Car Parking	150
11	Near Laitumkhrah Police Station		70
12	Opposite Laitumkhrah Point		165
13	Near District Transport Office		40
14	Commercial complex at Polo		100
15	Secretariat Hill		660
16	Laitumkhrah municipal market		100
<b>Retrofitting and Upgradation of 3 Multi-level Parking</b>			
a	Khliehiew		Cars -252
b	IEW Mawlong		Bus -87
c	Anjalee Parking (Opposite to Anjalee Galleria)		Trucks - 65

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA

PROPOSED PRAKING AREA



Legend

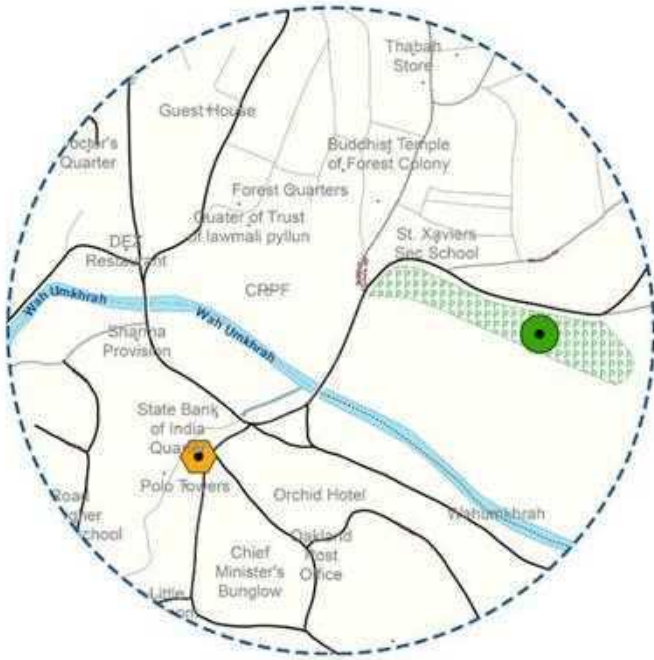
- |                       |                                |                             |
|-----------------------|--------------------------------|-----------------------------|
| <b>Baseline Info.</b> | <b>Administrative Boundary</b> | <b>Parking</b>              |
| National Highway      | District Boundary              | Off Street Parking          |
| State Highway         | Planning Boundary              | On Street Parking           |
| Major District Road   | Planning Districts             | Proposed Off Street Parking |
| Other District Road   |                                |                             |
| Bypass                |                                |                             |
| Service Road          |                                |                             |
| Major City Road       |                                |                             |
| Minor City Road       |                                |                             |
| Other Public Road     |                                |                             |
| Other Private Road    |                                |                             |
| Village road          |                                |                             |

Scale - 1:8,000

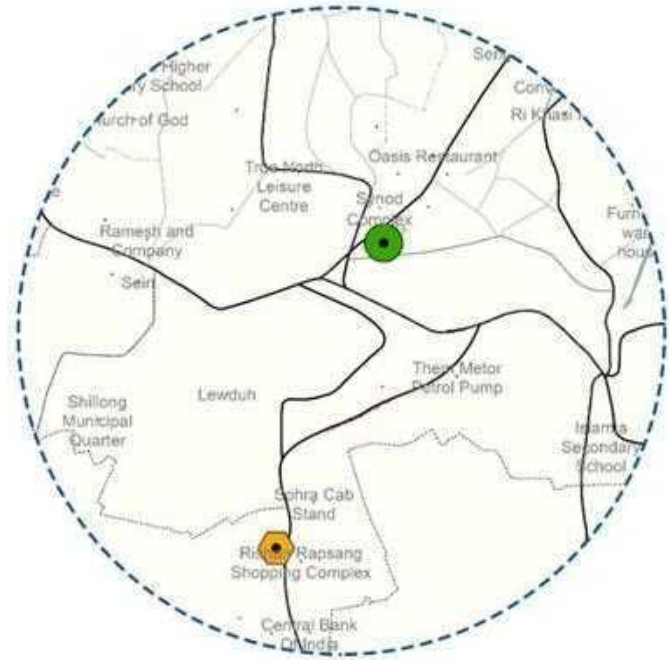
KEY MAP



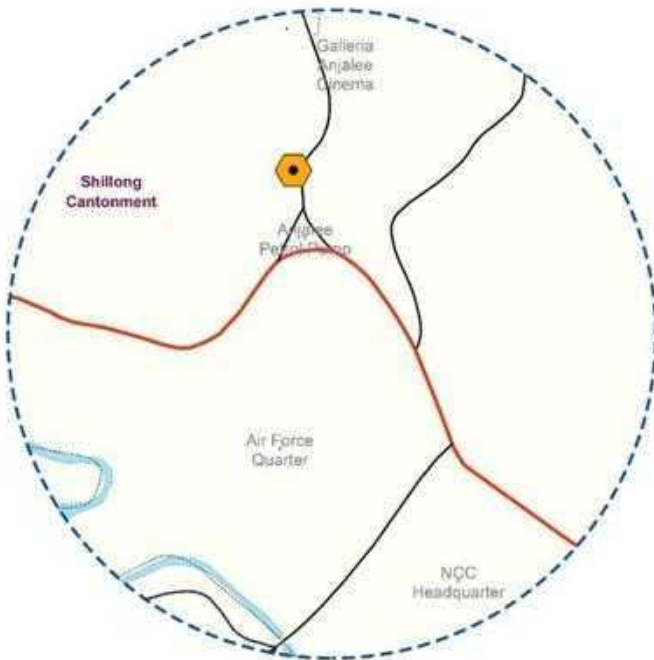
Figure 7-82: Proposed Parking Area



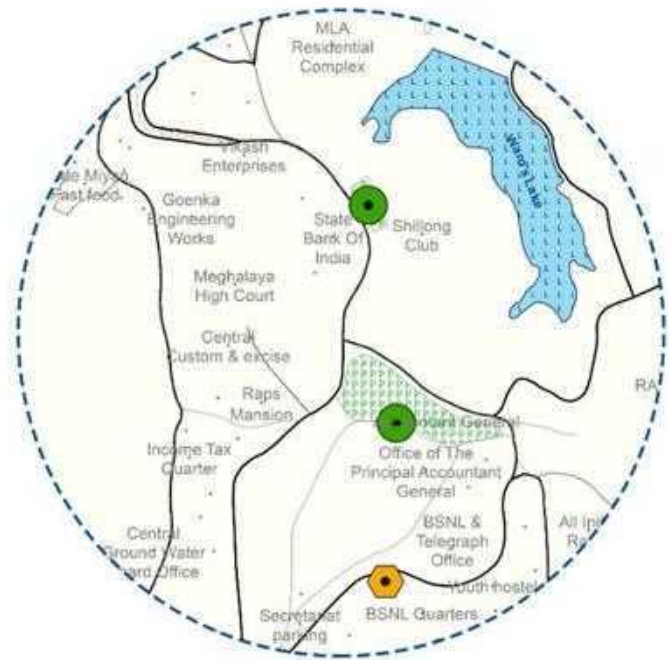
Enlarge at "A"



Enlarge at "B"



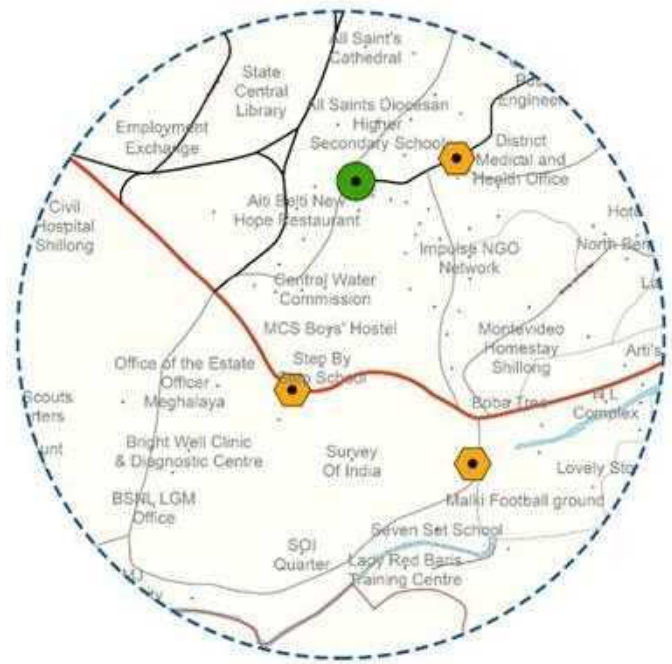
Enlarge at "C"



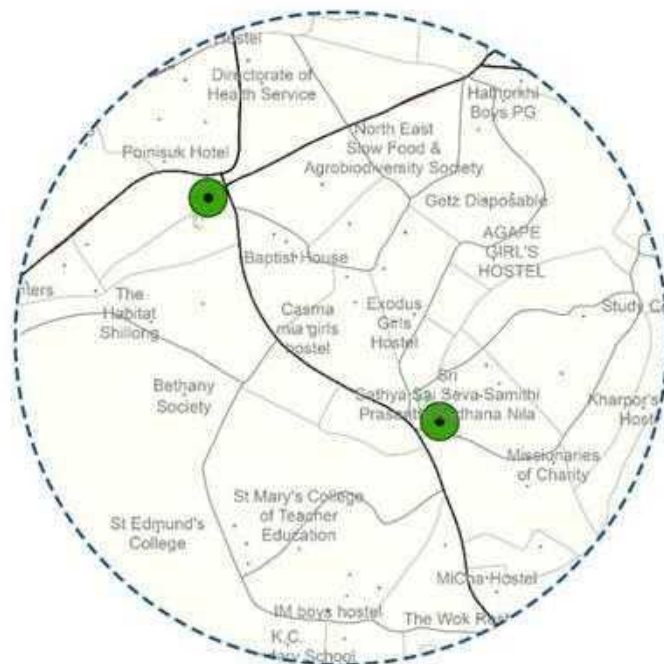
Enlarge at "D"



Enlarge at "E"



Enlarge at "F"



Enlarge at "G"

Figure 7-83: Enlarge Details of Figure 7-82





## 8 INDUSTRY & COMMERCE

### 8.1 ECONOMIC PROFILE OF MEGHALAYA

Meghalaya is one of the industrially backward states of the country. In 2019-2020 the Gross State Domestic Product (GSDP) of the state was Rs. 0.37 trillion (US \$5.19 billion) and in the last five years this increase was at a Compound Annual Growth Rate (CAGR) of 9.85 % (IBEF, 2020). In 2015-16, Meghalaya's GSDP was US \$ 4.19 billion which recorded the highest GSDP in the North Eastern States. The GSDP recorded in 2016-17 was US \$5.59 billion, which also stood as the highest GSDP among the North Eastern states. In 2018-19, the GSDP of the state stood at Rs. 0.33 trillion (US \$ 4.57 billion) (IBEF, 2019) and has been witnessing a constant rise over the years (Figure 8-1).

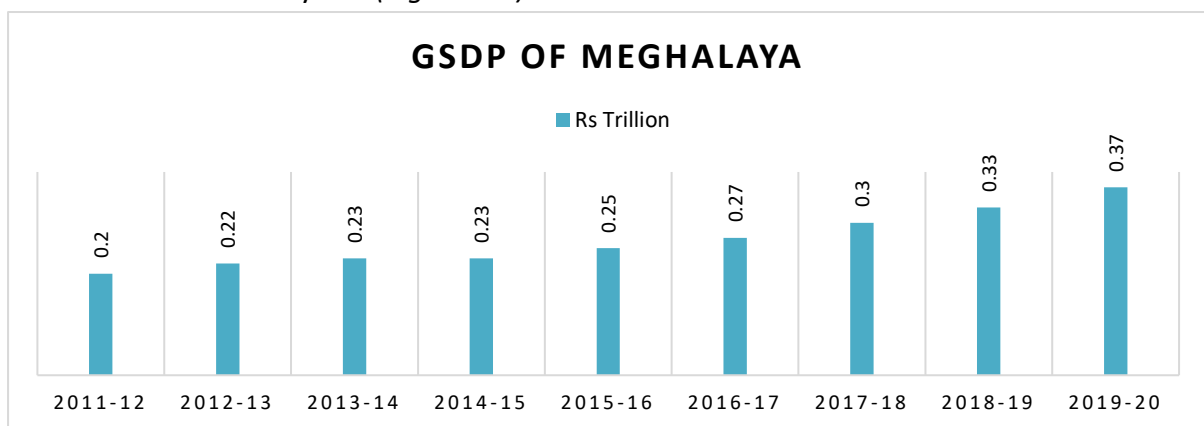


Figure 8-1: GSDP of Meghalaya

The Net State Domestic Product (NSDP) of Meghalaya stood at Rs. 0.30 trillion (US \$4.14 billion) with the CGAR of (in Rs) 6.93% from 2011-12 to 2018-19 while the state's per capital NSDP in 2018-19 reached Rs 85,609 (IBEF, 2019) (Figure 8-2).

In the financial year 2020, the production of limestone reached 6.9 million tonnes and the export of raw materials like minerals and ores stood at US\$ 29.15 million and the export of coal, coke and briquettes was at US\$ 7.87 million (IBEF, 2019).

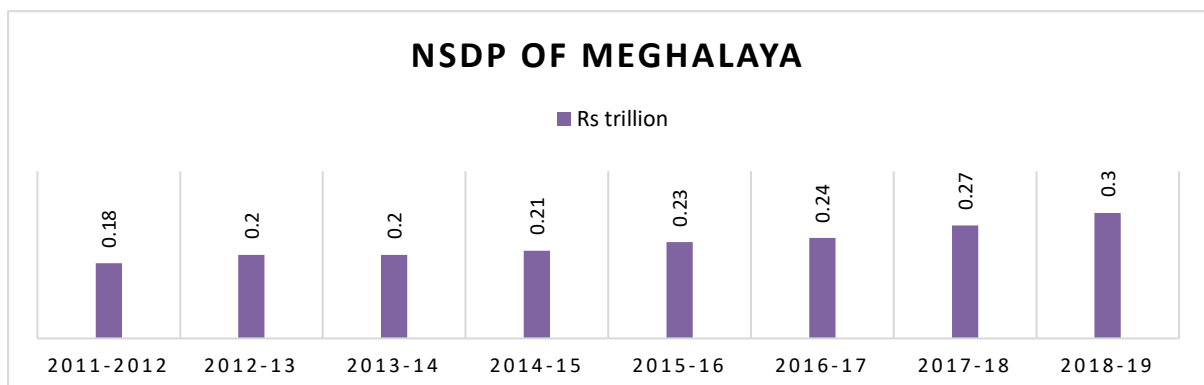


Figure 8-2: NSDP of Meghalaya

## 8.2 HUMAN DEVELOPMENT INDEX (HDI)

The Human Development Index (HDI) is an index to measure the quality of life of people in a place. It is a comparative index where the states or districts are given a rank depending upon their performances. The performances based on three components

1. Life Expectance at Birth
2. Education Index
3. Standard of living.

In 2011, Meghalaya ranked 26<sup>th</sup> in the country with a score of 0.585 HDI value. Meghalaya ranked 7<sup>th</sup> among the eight North Eastern States doing only slightly better than Assam. The performance of Meghalaya has been constantly poor while the rest of the states are showing significant improvements in their rankings. The health sector is poor in the state and needs significant improvement.

## 8.3 NATURAL RESOURCES OF THE STATE

Meghalaya has been blessed with abundant natural resources and forest reserves. The state receives an annual rainfall of 1,150 cm and hosts a wide range of biodiversity in terms of flora, fauna, medicinal plants, various water bodies and other resources like coal, limestone, quartz, feldspar, granite, industrial clay and uranium, etc. The soil type of Meghalaya includes red- loamy and laterite and supports a variety of crops. The main industries of Meghalaya are tourism, agriculture and food processing, horticulture, mining, hydroelectric power, dairy and livestock, handloom and handicrafts and steel processing (IBEF, 2010). There are also a few cement plants and steel plants in Meghalaya. The mineral resources of the state has not been used to its potential due to the bad industrial infrastructure of the state and the poor level of industrialisation.

The forest reserve of Meghalaya is huge with 928815 ha of land under forest area (classified and unclassified) (Directorate of Economics and Statistics, Govt. of Meghalaya, 2019). The important species of trees available are pine, bamboos, sale and teak. The forest reserve provides timber, fuel wood, tannin, fodder, gums, resin, shellac, essential oils, latex, fats, fibre, edible fruits and medicinal plants.

## 8.4 PRIMARY SECTOR

### 8.4.1 AGRICULTURE

Meghalaya has suitable agro-climatic conditions. The main food crops of the state are rice, pulses, chillies, black pepper, potatoes and the principal non-food crops of the state are rubber, cotton, jute, mesta (Directorate of Economics and Statistics, Govt. of Meghalaya,

2019). The state produces one of the best quality of turmeric in the world. The total cropped area in the state in 2017-18 was 309205 ha.

#### 8.4.2 HORTICULTURE

The state is suitable for sub-tropical and temperate fruits. The principal fruits of the state are banana, pineapple, sophie (*Myrica nagi*), papaya, guava, citrus fruits and jack-fruit. East Khasi Hills widely grows temperate fruits like peach, plums and pears (Department of Agriculture and Farmer's Welfare). In 2018-19, the state produced 324.67 thousand tonnes of fruits in 33.37 thousand hectares of area, 531.88 thousand tonnes of vegetables in 49.84 thousand hectares of area, 91.70 thousand tonnes of spices in 18.18 thousand hectares of area and 31.41 thousand tonnes of plantation crops in 25.94 thousand hectares of area (IBEF, 2019).

The practice of floriculture is a recent development in the state. There is a new awareness on the commercial aspects of marketing of flowers and other products related to the produce. The state has a very good climatic advantage for the cultivation of different types of flowers. Meghalaya is rich in flora and has a large production of Orchids (Department of Agriculture and Farmer's Welfare).

#### 8.5 SECONDARY SECTOR

The reason for the industrial backwardness of the state is that there are very few registered industries in Meghalaya. According to Directorate of Economics and Statistics, there were only 260 registered factories and 187 registered Small Scale Industries (SSIs) in the state in 2017 (Directorate of Economics and Statistics, Govt. of Meghalaya, 2019). In total, there are only 22520 registered Small Scale Industries in Meghalaya, which contributes to 0.21 % of the total SSIs in India. Meghalaya ranks sixth state from the bottom of the list with the least SSIs registered after Sikkim, Arunachal Pradesh, Goa, Mizoram and Nagaland. Of the total number of Small Scale Industries, 59.93% of them are in manufacturing sector with most industries the rural areas, 17.38% of industries are in repair and maintenance sector with most workshops in the urban areas and 22.69% industries are in services sector with maximum units in the urban areas (Development Commissioner (MSME)) (Table 8-1).

Table 8-1: Classification of Available Industries in Meghalaya

Meghalaya	Manufacturing		Repair & Maintenance		Services		Total
	Rural	Urban	Rural	Urban	Rural	Urban	
	47.32	12.61	0.79	16.59	2.55	20.14	

Under large and medium industries, Meghalaya mostly houses manufacturing industries like cement, steel, coke, ferro-alloy, food processing industries etc.

## 8.6 INDUSTRIES IN SHILLONG PLANNING AREA

Shillong Planning Area has an Industrial Estate of 202.44 acres in Umiam, Ri-Bhoi District. The functioning units in the industrial area are listed in *Table 8-2*.

**Table 8-2: Functioning Units in the Umiam Industrial Area, Umiam, Ri-Bhoi District as on 29.02.2020**

S No	Items of Manufacturing	No. of Industries
1	Roller Flour Mill	1
2	Bread	1
3	Poultry feeds, Pig feeds, Cattle feeds	1
4	Hatchery	1
5	PVC pipes and fittings (electrical and Hardware)	2
6	Saw cum veneer mill, Veneers, Veneers drying	1
7	IMFL Bottling	1
8	Feed mill	2
9	Ferro Silicon	1
10	PVC water storage tanks	1
11	HDPE/PP Bags	1
12	Meat processing	1
13	Saw cum Veneer Mills	17
14	Saw mills	3
15	NiCd and NiMh Battery	1
	Li-on and Li-om polymer batteries	
	Primary Lithium Batteries	
	Battery Chargers	
16	Packaged Drinking Water	1
17	Biomass based briquettes	1
18	Bamboo particle board	1

The list of Small Scale Industries in Shillong Municipal Areas according to Census 2011 are

- Manufacture of food products
- Manufacture of Dairy Products
- Manufacture of bakery products
- Processing and preserving of meat
- Processing and Preserving of fruits and vegetables
- Manufacture of cocoa, chocolate and confectionery
- Manufacture of prepared meals and dishes
- Manufacture of other food products
- Manufacture of textiles
- Spinning, weaving and finishing of textiles

- Preparation of spinning and textile fibres
- Weaving of textiles
- Manufacture of other textiles.
- Manufacture of wearing apparels.
- Manufacture of leather and related products.
- Manufacture of foot ware.
- Manufacture of wood products, cork products, straw products and plaiting materials.
- Printing and reproduction of recorded media.
- Manufacture of chemicals and chemical products.
- Maintenance and repair of motor vehicles
- Manufacture of furniture
- Manufacture of jewellery and related activities
- Repair of electrical equipment.

There are many food processing and apparel/ textile industries within Shillong city and the industrial estate has more large-scale industries. The advantages of an industrial estate are that there are infrastructures available like power, water supply, waste water treatment plants etc., there can be centralised buying of raw materials and dispatch of finished products, mutual cooperation, low investments needed etc. An industrial estate or a Special Economic Zone (SEZ) provides economies of agglomeration like availability of skilled labours, maintenance and service facilities, presence or support of financial institutions etc., which are helpful for new entrepreneurs. The industrial sector is improving over the years however; the rate of growth is slow. Shillong Planning Area has the potential and the need to host an industrial estate for SSIs/MSMEs that can provide employment and entrepreneurial opportunities with low initial investments.

## 8.7 TERTIARY SECTOR

### 8.7.1 TOURISM

Meghalaya's biggest asset is the natural environment that it has to provide. The state is capitalizing on its scenic environments, rivers, waterfalls and forests. The climate of the state adds to this growing service sector. The potential of the state to develop its tourism sector is remarkable. Meghalaya implemented the Swadesh Darshan Scheme well and ranked fourth best performer nationally. In 2019, 1.25 million domestic tourists visited the state (IBEF, 2019).

### 8.7.2 PERCENTAGE DISTRIBUTION IN GROSS STATE DOMESTIC PRODUCT (GSDP)

In 2016-17, the tertiary sector of the state was the fastest growing sector and contributed 51.79% to the total GSDP of the state. The secondary sector was the second largest contributor at 27.95% whereas the primary sector contributed the least at 20.27%.

However, there has been a decline at the contribution in the GSDP by the secondary sector, which grew at a CAGR of 2.98% from 2011-12 to 2016-17. The tertiary sector grew at the highest CAGR of 9.61% whereas primary sector grew at a CAGR of 4.40%, which also saw a decline in the overall contribution in GSDP (IBEF, 2018). Therefore, the tertiary sector has been growing at the fastest rate alike the rest of the country (Figure 8-3).

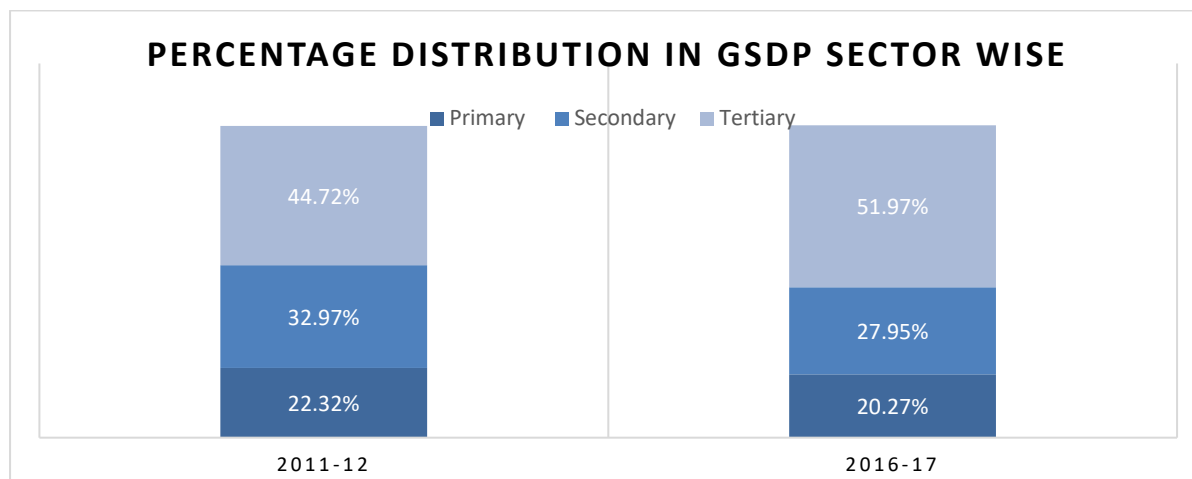


Figure 8-3: Percentage Distribution in GSDP Sector Wise

### 8.7.3 PERCENTAGE DISTRIBUTION OF GROSS STATE VALUE ADDED (GSVA)

Gross Value Added is the measurement of the contributions made by the final individual products of a region to the GDP of the region.

The GSVA of tertiary sector is the highest and has grown from 44.72% in 2011-12 to 57.24% in 2017-18 at the CAGR of 12.55 percent. The primary sector has a GSVA of 25.92% in 2017-18 which grew from 22.32% in 2011-12 at a CAGR of 10.38% and is the second largest contributor to the state. The secondary sector is the smallest contributor to the state GDP with a GSVP of 16.83% in 2017-18, which came down from 32.97% in 2011-12 at a CAGR of 6.35%. The growth in the tertiary sector is attributed to the growing tourism industry, real estate, trade, finance, transport, communications and other services (Figure 8-2).

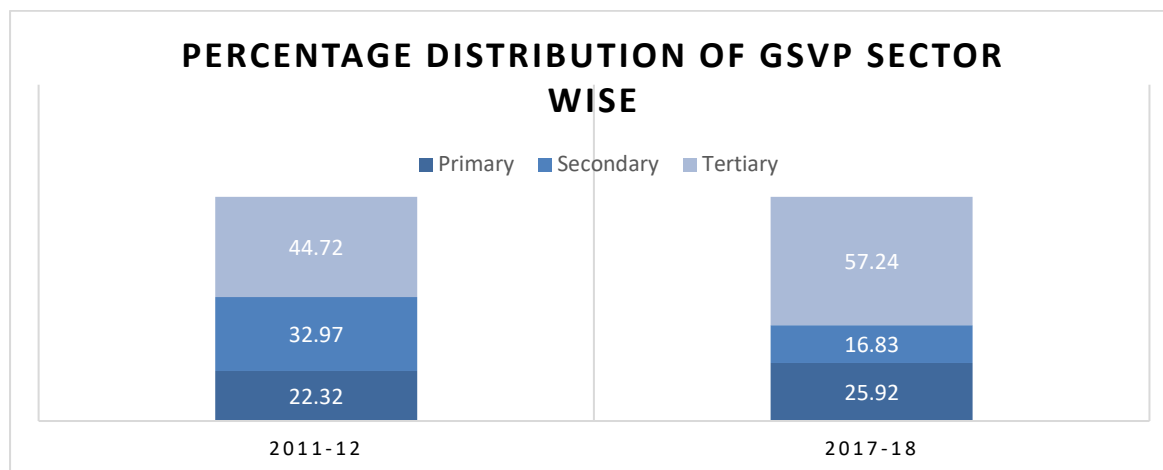


Figure 8-4: Percentage Distribution of GSVP Sector Wise

## 8.8 THRUST AREAS

Tourism industry, horticulture, agro-processing, minerals, electronics and IT sector have been identified as the thrust sectors of the state in 2020 (IBEF, 2020). The Directorate of Economics and Statistics of Meghalaya have selected the same areas as the thrust areas for many years. Other than that, the potential economic areas of Meghalaya are its forest reserve, the bio-diversity of the state and its potential for medicinal plants industry. The state hosts 834 of the 6000 medicinal plants of India. The state is also leading in the floriculture sector among the North Eastern States in terms of production and supply to the mainland markets. Meghalaya is one of the leading bamboo producers in the country with about 14 per cent of the land covered by bamboo forests.

## 8.9 WORKERS DISTRIBUTION AND OCCUPATION PATTERN IN SHILLONG PLANNING AREA

The Work Participation Rate of Shillong Planning Area is 42.79% whereas the WPR of the units of SPA are as following in *Table 8-3*.

**Table 8-3: Work Participation Rate**

	SMA	SCB	CTs	Villages
<b>WPR</b>	42.52%	44.83%	41.83%	46.12%

Nearly 89% of the male main workers are associated with non-agricultural work according to Census 2011. This percentage grew from 88.76% in 2001 to 88.99% in 2011 which implies that majority of the male workers have been associated with non-agricultural work for the last two decades.

**Table 8-4: Distribution of Workers in Shillong Planning Area**

		Cultivators	Agricultural Labourers	Household Industry	Other workers
<b>Total workers</b>	Main Workers	4.6%	1.47%	0.67%	86.42%
	Marginal Workers	0.41%	0.81%	0.11%	5.48%
<b>Male Workers</b>	Main Workers	4.05%	1.47%	0.73%	88.26%
	Marginal Workers	0.26%	0.57%	0.08%	4.57%
<b>Female Workers</b>	Main Workers	5.71%	1.49%	0.54%	82.71%
	Marginal Workers	0.72%	1.32%	0.16%	7.32%

The *Table 8-5* shows the distribution of workers in the three sectors and which towns and villages are agriculture oriented and which are the ones with a strong service sector workforce. The workforce in household industry is very less in all the towns and villages. The villages of Ri-Bhoi District are mostly involved in agricultural works except Nongsder, which has a high workforce in the service sector. All the towns of Shillong Urban Agglomeration Area are involved in service sectors and have a very small population of the workforce in agricultural sector. These towns are urbanised and have almost negligible agricultural lands. The villages of East Khasi hills have a good mix of workers in both the sectors.

Table 8-5: Distribution of Workers in the Towns and Villages of Shillong Planning Area (%)

	Village/Towns	Agriculture		Household Industry		Other workers	
		Main	Marginal	Main	Marginal	Main	Marginal
	SMB	0.26	0.10	0.55	0.07	95.42	3.56
	SCB	0.74	0.18	0.24	0.12	94.07	4.61
CTs of Shillong Urban Agglomeration Area	Mawlai	0.90	0.16	0.70	0.20	92.08	5.92
	Pynthormukhrah	5.99	0.50	0.38	0.01	87.81	5.28
	Nongmysong	2.08	0.26	0.68	0.03	89.73	7.188
	Mawpat	3.96	0.11	0.27	0.03	91.59	4.00
	Umpling	0.73	0.19	0.06	0.09	91.61	7.30
	Nongthymmai	1.24	0.08	0.57	0.05	94.19	3.85
	Madanriting	1.71	0.32	0.44	0.35	85.17	11.98
	Nongkseh	4.02	1.80	0.24	0.06	78.72	15.14
	Umlyngka	7.12	2.05	0.12	0	68.74	21.95
	Lawsotun	6.82	0.46	0.42	0	88.23	4.05
Villages of East Khasi Hills District	3rd Mile	10.47	1.58	0.79	0.19	73.51	13.43
	4 <sup>th</sup> Mile	3.66	0.22	0.68	0.68	84.43	10.29
	5 <sup>th</sup> Mile	2.17	0.59	0.39	0	93.86	2.97
	6 <sup>th</sup> Mile	10.97	0	0	0	85.97	3.04
	Ishyrwat	0	20	0	3.63	18.18	58.18
	Kreit	77.46	1.40	0.46	0	18.31	2.34
	Laitkor	6.49	4.00	0.22	0	81.65	7.62
	Lapalang	20.46	8.20	3.22	0.09	65.75	2.24
	Lumdiengngan	6.97	79.65	0.58	2.90	5.23	4.65
	Lumdiengsai	67.44	24.65	0	0	7.44	0.46
	Lumkseh	53.40	45.02	0	0	1.04	0.52
	MadanMawkhar	89.51	0	0	0	10.48	0
	MadanSaisiej	71.02	8.87	4.67	0	12.15	3.27
	Madanfootball	93.91	0	0	0	6.08	0
	MawdiangDiang	2.86	0	0.81	0	93.85	2.45
	Mawiong	0	88.57	0	0	11.42	0
	Mawkasiang	23.19	0.51	0.51	0	74.22	1.54
	Mawkhanu	88.32	3.64	0	0	8.02	0
	Mawklot	29.05	1.35	2.19	0	65.70	1.68
	Mawkynring	54.87	45.12	0	0	0	0
	Umshing Village	23.33	1.38	3.96	0.27	67.43	3.59
	Mawlong	90.31	1.56	1.25	0	6.87	0
	Mawnarian	89.28	5.35	0	0	4.76	0.59
	Mawnianglah	10.71	1.32	2.70	0.06	81.72	3.46
	Mawpdang	43.82	0.35	0	0	55.45	0.35
	Mawpynthih	94.03	0.25	0	0	5.21	0.50
	Mawsharoh	78.94	10.52	0	0	10.52	0
	Mawtarwar	14.53	2.64	3.65	0.30	53.25	25.60
	Nongkohlew	61.74	1.63	0.54	0	32.24	3.82
	Nongpiur	49.27	8.11	0.28	0.28	36.52	5.50
Nongrah	1.23	0.11	1.78	0.03	94.91	1.90	



	Nongsawing	86.00	0	0	0	10.00	4.00
	Nongtyrkhang	99.04	0	0	0	0.95	0
	Nongumlong	28.86	9.62	0.68	0.51	53.26	7.04
	Syllai-U-Lor	41.88	7.85	8.90	0	41.36	0
	Umphrew	81.32	1.20	0	0	17.46	0
	Umroh	31.03	13.21	4.02	0.57	31.60	19.54
	Umrynjah	75.08	13.95	0	0	10.63	0.33
	Umsawli	0	0	0	0	62.96	37.03
Villages of Ri-Bhoi District	Nongsder	6.26	1.35	2.08	0.20	76.48	13.58
	Kyrdeng	93.02	2.32	0	0	2.32	2.32
	Lumshyiap	94.05	1.98	0	0	3.96	0
	Lumsohphoh	87.38	4.50	0	0	7.20	0.90
	MadanNonglakhia t	94.54	0	0.36	0	5.09	0
	Mawdkuk	79.31	1.14	1.14	0	16.09	2.29
	Mawthei	91.93	0.32	0	0	3.54	4.19
	Pyllun	48.35	2.93	1.83	0	44.32	2.56
	Syllei-U-Lar	65.32	22.58	0	0	12.09	0
	UmdenArka	3.78	87.62	0.34	0.68	4.46	3.09
	Umiam	20.72	33.78	3.37	0.45	39.18	2.47
	Umiet	66.33	1.65	0	0	30.36	1.65
	UmsaiPrah	91.08	0	0	0	6.20	2.71
	Umsarang	80.72	6.02	0	0	0	13.25
Wahmyntait	98.36	0	0	0	1.63	0	

	Towns/Villages with larger workforce in Service sector (other workers)
	Towns/Villages with larger workforce in Agricultural Sector (Agricultural workers+ cultivators)
	Town/Villages with a more or less balanced workforce in agriculture and service sector

## 8.10 TOURISM- PLACES OF INTEREST IN SHILLONG PLANNING AREA

Shillong has a few places of interest within the city and within its planning area but it mostly serves as the key node of travel to the other parts of the state. The city has many hotels, guesthouses, cab services, restaurants offering diverse food options and markets. Along with the said services, the city also has a few tourist spots. In general, most tourists especially groups that travel with families prefer to lodge in Shillong and take day trips to other tourist destinations within the state.

The tourist destinations in Shillong Planning area are Lady Hydari Park, Don Bosco Centre for Indigenous Cultures, Wards Lake, Cathedral of Mary Help of Christians, Capt. Williamson Sangma State Museum, Golf Course, Matilang Park, Shillong Peak and Elephant Falls all of which falls in East Khasi Hills District and Umiam Lake, Lum Nehru Park, Dwar Ksuid, Orchid Resort and Lum Sohpetbneng all of which are in Ri-Bhoi District and at the edge of the planning area. The planning area in particular does not have too many natural tourist sites compared to the rest of the state however; it can be developed as the node or the base station of travellers.

## 8.11 ANALYSIS

### 8.11.1 IMPACT ON THE CITY TRAFFIC DUE TO CURRENT SERVICE SECTORS

Shillong City faces heavy traffic throughout the day. Cars flow in to the city for work, business, market, education, health services and other purposes. From the survey conducted, it is observed that 61.7% of the total trips made are work related out of which cars make up 39.06% of the trips, taxis make up 30.78% of the trip and two-wheelers make up 4.24% of the trips. Combining cars and taxis, four wheelers make up 69.84% of the total work related trips inside Shillong Planning Area.

Table 8-6: Reason of Travel in SPA

	Education	Work	Business	Shopping	Medical	Others	Total no of trips
No of trips	3	471	40	123	12	114	763
% of trips	0.39	61.7	5.2	16.12	1.57	14.94	100

Table 8-7: Mode of Travel in SPA

	2 wheeler	Car	Taxi	Bus	Walk	Cycle	Total no of trips
Number	20	184	145	1	120	1	471
%	4.24	39.06	30.78	0.21	25.47	0.21	100

Out of the 471 work related trips in Shillong Planning Area (from the survey conducted) (Table 8-7), the highest percentage of trips i.e., 9% of the trips are made to TAZ 7, which is European Ward 1. European Ward 1 is the administrative zone of the city and houses the Secretariat Hills and other important State and Central Government Offices including the High Court of Shillong (Figure 8-5).

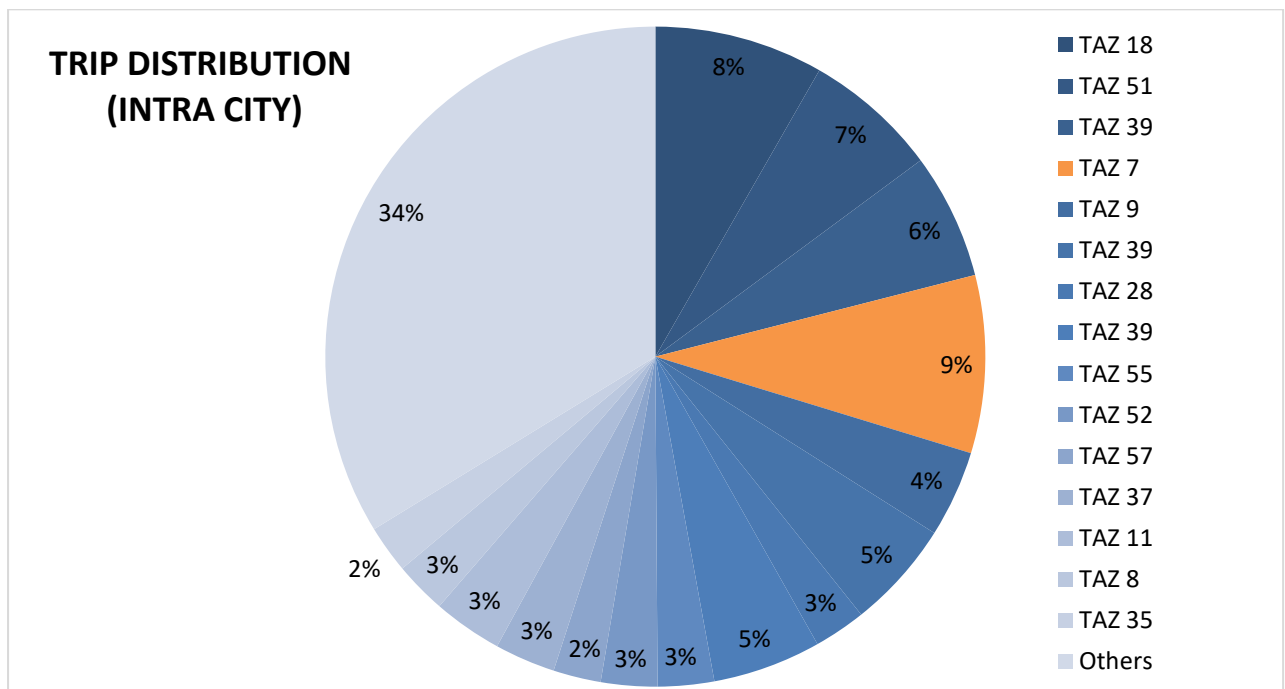


Figure 8-5: Trip Distribution (Intra city)

Of the total 9% trip made to European Ward 1, private cars make 58.53% of the trips, taxis make 34.14% of the trips and 7.31% of the trips are made by two-wheelers. This significantly contributes to the traffic of the city and increases the inconvenience of the citizens. Therefore, the administrative unit should be moved out of the city so that 9% of the traffic can be diverted outside the city. This will give the city many opportunities to use the existing land for development of other services and activities that are needed for the city and its citizens.

## 8.12 PROPOSALS

**Moving the Administrative Zone (Secretariat Hill) outside the city and develop the land for economic activities** - Meghalaya State Secretariat and other administrative units is proposed to be set up in Umsawli and the existing land should be developed as a commercial zone along with open public spaces for recreation. The European Wards are government lands and any kind of economic developments will be easier to conceive here. In addition, Police Bazar is the commercial hub of the city and hence a more dynamic Central Business District can be proposed for Shillong in European Ward 1 along with Police Bazar that will remarkably add to the development of the city and provide employment opportunities and space for leisure activities to the citizens.

Many formal and informal commercial units can come up in the area at their designated zones along with eateries, eating and sitting spaces, open spaces, parks, greeneries, jogging tracks, cycling tracks, skating rings, exhibition and gathering spaces.

**Industrial Estate for SSIs/MSMEs** - Industrial Estates have many advantages as they provide centralised infrastructure, services, financial assistance as well as available workforce to the industries. Shillong city has many Small Scaled Industries (SSIs) and the potential to open up more if the right assistance is given.

An Industrial Estate can be proposed in Lumdiengngan for SSIs and MSMEs with a centralised infrastructure and financial assistance for the industries. Potential industries like food processing, apparel industries, handicrafts and others can be hosted there.

From the Industrial suitability analysis from Chapter 4, it has been found that the villages at the periphery of the Shillong Planning Area like Madan Nonglakhiat, Umden Arka, Lumdiengngan etc., has the highest suitability. These fringe villages needs more economic activities so that they can attract a substantial amount of population and decongest the core city. Lumdiengngan has been chosen for the Industrial Estate for SSIs/MSMEs as it is close to the airport and the bypass passes through the village. Therefore, it has a good connectivity and a potential to cater to housings.

**Agro based Industrial Estate** – Meghalaya and the other North Eastern States are primarily meat eating states with a high meat demand and consumption. This provides the state an opportunity to take animal rearing like pigs and poultry farming from their backyards to an industry level production for sufficient supply to the state and export to the other states. Considering the opportunity and the potential, the Industrial Estate can host

- Animal Rearing farms
- Poultry Farms
- Dairy Farms

Suitability analysis for animal husbandry, rearing, and dairy farm, Mawtawar has been chosen as the most suitable site for an Agro Based Industrial Estate. This estate will host animal rearing farms, poultry farms, dairy farms and other food processing units. Mawtawar has the potential to grow into an urban town by 2041 and has a major road crossing through the village. It is close to Mawlai and has significant population strength. At present 58.25% of the male main working members are involved in non-agricultural practices and with the advent of an Agro Based Industry a larger workforce will get the opportunity to engage in secondary sector. Policies for the Small Scale Industries of the region.

**Setting up Industries for Bamboo Products** - Many SSIs in Meghalaya fall in the category of sick industries<sup>2</sup> or have already closed down. The reason for the failure is lack of entrepreneurship development, poor institutional assists, lack of financial support, prevailing insurgency of the region etc. Investment opportunities should be provided for the Small Scale Industries (SSIs) and Micro, small, medium scale enterprises (MSMEs) and entrepreneurial initiatives can be supported with the policies.

**IT Park** - With the exceptional growth of the IT sector, which has turned India into a software superpower, there are thousands of IT companies opening up all over the country. The growth of the service sector is mostly due to the IT sector. Government of Meghalaya envisioned of transforming Meghalaya into one of the most preferred and leading destinations in IT/ITeS, high-end technology and electronics industry in North East India (Information Technology & Communication Department, Govt. of Meghalaya). To realise this vision, infrastructure and investments are required. An IT Park is proposed in Umden Arka, Ri-Bhoi District after considering the IT Park suitability. This is the most preferred location as it is close to the airport and the Shillong by-pass crosses through the village. With proper investments and infrastructure, Umden Arka can be a suitable host for the next IT park of Shillong.

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<sup>2</sup> An industry that existed for more than five years and have amassed loss equal to or more than the whole net worth of the industry at the end of any financial year

**Improving the hospitality industry for the increasing Tourist Influx in the region** - Shillong Planning Area has the potential to develop itself as the node of tourism for the whole of Meghalaya. As the tourist footfall is increasing every year, more and more hotels and guesthouses are required to serve the tourist population. A well-rounded and systemized hospitality industry can be proposed where all the hotels, lodges and guesthouses.

**Decentralisation of hospitality industry to the villages of Shillong Planning Area** - Most of the hotels, restaurants, cafes, etc., are concentrated in Shillong City especially in Police Bazar area. Decentralization of the hotels is also important, as the Municipal Area is getting denser day by day. This also adds to traffic congestion, more waste generation and increases the demand of water and power supply. Therefore, newer hotels should be taken out of the municipal area and into the fringes of the planning area so that it can bring about economic diversification in the villages of the planning area. Shops and markets can start beside the hotels, followed by restaurants, cab services and other leisure activities for tourist leisure and entertainment. This will also enhance the small-scale handicraft industries of the region.

**Employment generation** - Meghalaya has a high literacy rate and therefore a strong labour pool. In addition to that, a large portion of the population, even in the rural areas can understand and speak English therefore increasing their credibility in service sector. The advent of more industries like MSMEs, SSIs, hospitality etc., will give the youth of the villages' employment opportunities and encourage them to start their own ancillary industries.



## 9 ECOLOGY & ENVIRONMENT

### 9.1 INTRODUCTION

The rich bio-diversity of the state, the vast forest covers, streams, rivers and waterfalls, the climate, the abundant natural resources and the scenic beauty are the greatest natural assets and strengths of Meghalaya. Today, it has become crucial to safeguard the remaining environmental assets and then plan for the development of a region. Awareness regarding the importance of the environment and its fragility is spreading among the masses and many organizations and individuals are fighting to protect the same. The unprecedented growth of cities and regions poses grave threats to the environment and if they are not checked, they may lead to immense damage to cities. During natural calamities like earthquakes, it is not the quake that is dangerous to the human life but the huge concrete jungle that collapses and causes casualties and other losses. The growing population, the surging number of cars on the roads, the decreasing tree cover, and every other human activity has an impact on the environment. The future cities and regions have to be planned around the environment and the natural habitat of plants and animal kingdom so that the natural resources and the ecosystem can be protected.

### 9.2 HAZARDS

The biggest threat to the region in terms of natural calamities is earthquake. Meghalaya and the whole of North East India is prone to earthquake. Shillong Planning Area being in seismic Zone 5 needs extra caution when it comes to urbanization and there should be strict building byelaws for every concrete building to be constructed. According to Meghalaya Building Bye- Laws, the permissible FAR (Floor Area Ratio) for the city is two. The municipal wards are very dense with a combined population density of 14308.12 sq.km. Therefore, the construction of buildings should be highly regulated in such areas and the wards with the highest densities should be termed as further no construction zone.

### 9.3 FORESTS

#### 9.3.1 SACRED GROVES

The forests of Meghalaya have always been considered scared by the indigenous people of the state. There are 125 sacred groves in Meghalaya where the tribal people perform many rites and rituals. These are virgin forests that are protected by the locals and it is believed that goddess or 'U Basa' dwells in these forests and protects the land. Sacred Groves helps in environment conservation and hosts rich biodiversity of flora and fauna. They are protected by the indigenous knowledge of the tribal groups and their culture and traditions plays a very important role to maintain this symbiotic nature between the environment and humans. Mawphlang Sacred Grove is the closest sacred grove to Shillong at a distance of 25km from the city as there are no scared groves in the planning area.

### 9.3.2 RESERVED/PROTECTED FORESTS

Reserved Forests (RF) or Protected Forests (PF) are tree-clad areas that requires a certain degree of protection. No commercial activities are allowed in these forest reserves or with the products of these forests as they are preserved to protect the flora and fauna and the range of biodiversity in them.

Shillong Planning Area has 18.01 sq.km (1801 Ha) of protected forest areas. These reserved forests are in Raid Laban, Ishyrwat, Upper Shillong, Laitkor, Lawsohtun, Mawlai etc. No construction should be allowed within 100meters buffer of the protected forests.

## 9.4 WATER BODIES

Shillong Planning Area has numerous streams, ponds, rivers and their tributaries dotted across the region. The region has two main lakes that provide recreational activities for the locals as well as tourist destination spots for the travellers.

### 9.4.1 UMKHRAH AND UMSHYRPI RIVER

Umkhrah and Umshyrpi are two important rivers that flow through the city and into Umiam Lake. The two rivers join together to form the Roro River, which flows in to the Umiam Lake. These two rivers have degraded due to the excessive sewage flow into them. Their tributaries are no more than drain now. Due to the lack of proper sanitation and sewage system, the sewage seeps underground and into the rivers degrading its quality. The quality of surface water is worse as people throw garbage into them. Approximately 2.025 ML of sewage enters Umshyrpi and Umkhrah every year (Umiam, Shillong's 'waster' pride, 2009). Urban Affairs Minister, stated that the water quality of the two rivers fall in 'E' category after comparing the water quality with designated best use as notified by CPCB. This water is not fit for any household activities but can be used for industrial cooling, irrigation and controlled waste disposal (Meghalaya: From rivers to drains-the fate of Umkhrah, Umshyrpi rivers of Shillong, 2018).

### 9.4.2 WARDS LAKE

Shillong Municipal Area houses the Wards Lake, a manmade lake that is one of the most popular recreational spots in the city. It provides boating services and hosts many trees, birds and aquatic species. Wards Lake is next to the Botanical Garden and is a popular tourist destination and many locals visit the lake early in the morning for their exercises, walks and other activities. The greens of the lake and the surrounding area are refreshing and act as a respite to the locals.



### 9.4.3 UMIAM LAKE

Ri-Bhoi District accommodates Umiam Lake, which is the largest manmade lake of the state. The catchment area of the lake is over 220 sq.km and it was built primarily to store water for hydroelectric power generation. Many activities take place in the lake and its surrounding areas like camping, boating, fishing and other adventure sports like kayaking, sailing, water cycling skiing etc. There is a resort by the side of the lake and a park, which is famous for the variety of birds it hosts. The lake and the surrounding Sylvan Hills provides alluring scenic beauty and many tourists come on a daily basis from other states to enjoy the view over a cup of tea. The lake also provides ecosystem services at micro to macro levels and also caters to many services and economic needs.

In 2020, Central Pollution and Control Board (CPCB) monitored the water quality of the two lakes under National Water Monitoring Program and identified them as polluted water bodies. Umkhrah and Umshyrpi rivers flow into the Umiam lake carrying discharges from the city. The contamination level of the lake is rising along with the heavy silting, which deemed the water unfit for drinking.

### 9.5 ECO SENSITIVE ZONES

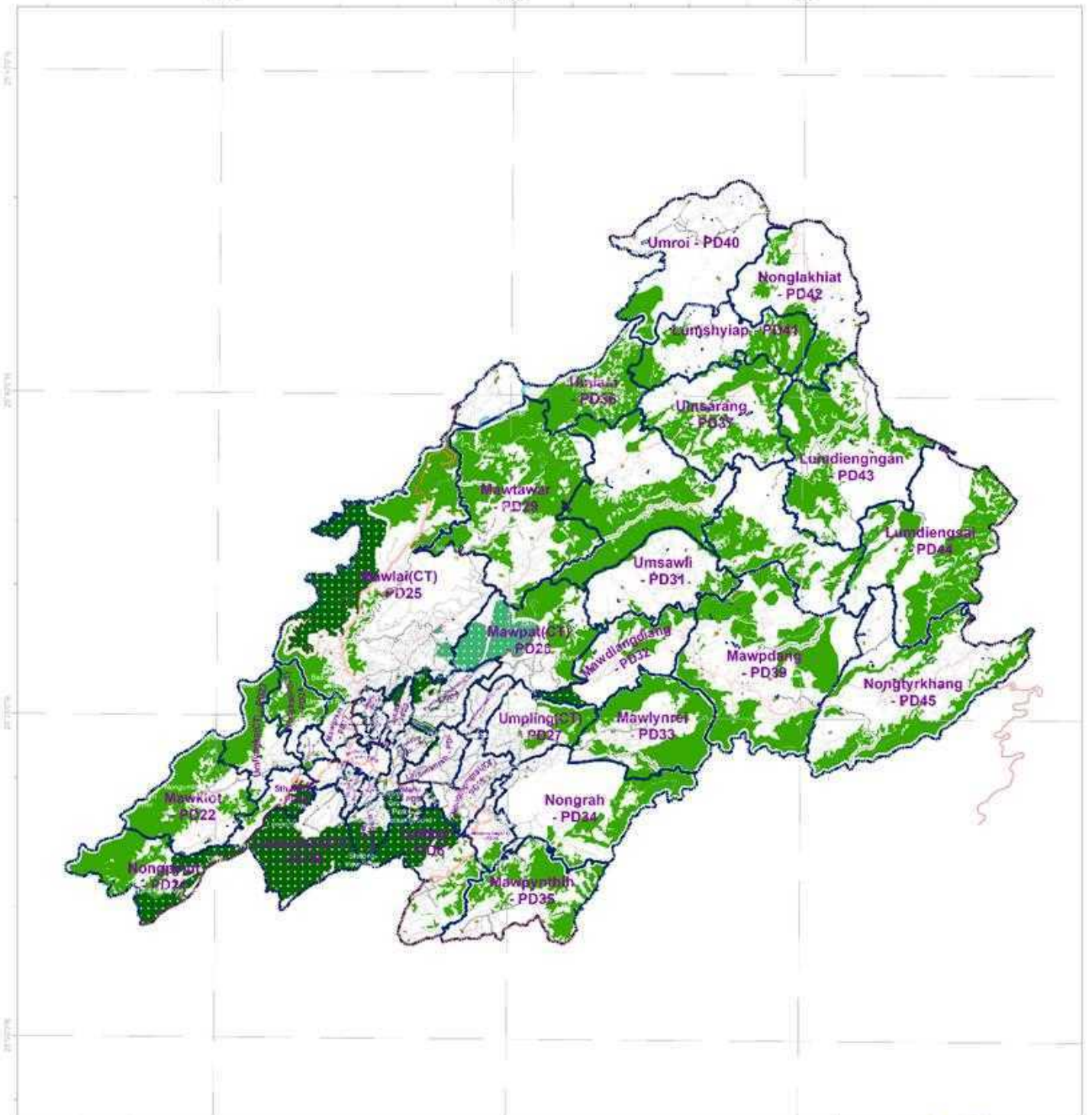
Eco Sensitive Zones are notified by the Ministry of Environment, Forests and Climate Change, Govt. of India. These are ecologically fragile areas, which are rich in biodiversity, and needs protection. Shillong Planning Area has an area of 0.056sq.km (5.6 Ha) of Eco-Sensitive Area, which includes the Botanical Park next to Wards Lake. There are no industrial nor major commercial activities around the place. There are mostly residential units around the botanical park.

### 9.6 OPEN SPACES

Open spaces are crucial to any cities as they provide recreational spaces along with a breather to the city. The greenery, the water bodies, the nature provides a respite to the citizens of the city from their daily hustle and bustle. These open green spaces also acts as lungs to the city and provides buffer from air and noise pollution. Open spaces include recreational spaces, organized green spaces as well as other common spaces like forests, vacant lands etc. (Town and Country Planning Organisation, 2015).

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA

ECOLOGY AND ENVIRONMENT FOREST, WATER SHEET, ESZ, OPEN SPACES



Legend

- |   |   |   |   |
|---|---|---|---|
| <p><b>Baseline Info</b></p> <ul style="list-style-type: none"> <li> National Highway</li> <li> State Highway</li> <li> Major District Road</li> <li> Other District Road</li> <li> Bypass</li> <li> Service Road</li> <li> Major City Road</li> <li> Minor City Road</li> <li> Other Public Road</li> <li> Other Private Road</li> <li> Village road</li> </ul> | <p><b>Administrative Boundary</b></p> <ul style="list-style-type: none"> <li> District Boundary</li> <li><b>Planning Boundary</b></li> <li> Planning Districts</li> </ul> | <p><b>Urban Land Use</b></p> <ul style="list-style-type: none"> <li> Drain</li> <li> Exhibition Ground</li> <li> Garden</li> <li> Golf Course</li> <li> Island(River/Lake)</li> <li> Lake</li> <li> Monument</li> <li> Park</li> <li> Play Ground</li> <li> Ponds</li> <li> Protected Forest / Notified Forest</li> </ul> | <ul style="list-style-type: none"> <li> Reserved Forest</li> <li> River</li> <li> Sports Centre</li> <li> Stadium</li> <li> Stream</li> <li> Swimming Pool</li> <li> Tank</li> <li> Dense Area</li> </ul> |
|---|---|---|---|

Scale - 1:75,000 Kilometers



Figure 9-1: Ecology and Environment in SPA

## 9.7 DEMAND GAP ASSESSMENT FOR OPEN SPACES IN SHILLONG PLANNING AREA

The Urban and Regional Development Plans Formulation and Implementation (URDPFI) guidelines have a set of norms for organized greens for hilly areas. Comparing the status of Shillong Planning Area to the guidelines, we find that Shillong Planning Area does not have housing area parks or neighbourhood parks especially in the municipal area. There are gardens and city parks in the city as well as numerous playgrounds. There is one botanical garden and a golf course in the city. However, there is a requirement for more neighbourhood level parks or city parks in general which can provide interactive spaces to the citizens. Considering the population forecast for 2041, the city would require 64.53 Ha to 129.06 Ha of Housing Area Parks, 77.44 Ha to 129.06 Ha of Neighbourhood Parks. The city has cultural gathering spaces and exhibition grounds.

Table 9-1: Demand Gap Assessment for Recreational Spaces

SNo	Category	Population Served/unit	Area Requirement (Ha)	Existing	Area (Ha)	Area for 2041 (Ha)
1	Housing Area Park	5000	0.50 to 1.00	--	--	64.53 to 129.06
2	Neighbourhood park	10000	1.20 to 2.00	Gardens	3.3	77.44 to 129.06
3	City parks/ playgrounds/ maidan/exhibition grounds/ cultural gathering grounds	For entire town at one or more sites, depending upon design and space availability	--	Many playgrounds available throughout SPA. Two city parks	100.7	More interactive spaces and city parks required
4	Botanical Garden	1 for every town	10.00 to 20.00	1	5.6	<b>Not required</b>
5	Recreational Complex including zoo	1 for every settlement with tourist potential	10.00 to 12.00	Golf Course	25.10	<b>Not required</b>

## 9.8 PROPOSALS

**Open spaces/ City Public Space** - World Health Organization suggests that every city should provide 9sqm of open space per person. URDPFI guidelines have its own set of norms for providing per unit open spaces for the required population. There is a shortage of open spaces for the population of Shillong Planning Area. In the municipal wards, there is also shortage of vacant lands that can be converted into parks and gardens. Therefore, a central public cum green space is proposed in European Ward-1 where many interactive sessions, games, discussions etc. can take place. This park like open space will consist of skating rings,

walking and jogging pathways, cycle track, benches, street lights, drinking water taps, a public toilet etc. This park will be proposed in the present Secretariat Hills, which is a government land, hence making the development easier. This public space is much needed for the city and will provide a relief to the citizens.

**Rejuvenation of Umkhrah and Umshyrpi Rivers** - Umkhrah and Umshyrpi rivers are the two main rivers of the city, which has now been turned down into no more than a drain with all the waste and sewage disposals in them. Cleaning of the rivers and their rejuvenation is necessary as it poses a threat not only to the health of the locals but also marks Shillong as an unkempt city. It also poses threat of river logging and flooding which the city faces every year during its period of torrential rain in and around Umkhrah River in Polo.

- Controlled to no-discharge and waste disposal in the rivers. Awareness should be created to keep the rivers clean. Every year, a river cleaning drive should be organized. The municipal board along with the local traditional heads should start imposing fines on violators and strict surveillance should be maintained to make sure individuals or commercial groups do not litter the rivers.
- A buffer as per NGT should be maintained as no development/ no construction zone.

**Rejuvenation of Umiam Lake** - Umiam Lake is not only a significant identity of the city but also means of economic sources for many along with providing an ecosystem to many species. Rejuvenation of the lake is very important to reverse the constant stagnation of the water quality.

- No untreated industrial waste should be allowed to be discharged into the lake.
- All industries in the Umiam Industrial Estate should have their own wastewater treatment unit.
- Awareness regarding the importance and need of keeping the lake clean should be spread.
- The resorts, hotels, teashops, should not be allowed to throw waste into the river and a proper surveillance should be maintained.
- No construction should be allowed within 50 meters of buffer from the lake.

**Decentralised Wastewater Treatment System (DEWATS)** - The proposed DEWATS for the wastewater treatment will be a significant contributor for lowering the sewage discharge into the rivers and lakes. If community wise DEWATS are constructed, then the seepage of sewage from soak pits can be avoided and there will be lesser infiltration of ground water. DEWATS will also reduce direct disposal of sewage into rivers.

## 10 GOVERNANCE & INSTITUTIONAL ARRANGEMENT

Meghalaya is one of the four North Eastern States that have been given the status of Sixth Schedule area other than Assam, Mizoram and Tripura by the Constituent Assembly in 1949 (Civils daily, 2020). Sixth Schedule areas are tribal areas with their own autonomous traditional governance bodies that are administered federally. In these autonomous areas, Autonomous District Councils (ADCs) which are set up by the Sixth Schedule of the Constitution protect the tribal customs, land and self-governing institutions.

### 10.1 SIXTH SCHEDULE

The Sixth Schedule to the Constitution of India was set up to protect the tribal communities of the North Eastern states from the 73rd and the 74th Constitutional Amendment Act (CAA). The Sixth Schedule protects the indigenous tribes of the North Eastern States, their ethnicity and their autonomy to administer their land and people in their traditional ways. Through the 22nd Amendment Act Article, 244A was added to the constitution in 1969 that enabled the Parliament set up Autonomous District Councils (ADC) to represent their respective districts in the scheduled areas (Bakshi, 2020).

### 10.2 BACKGROUND OF MEGHALAYA

About 97 percent of the state of Meghalaya is under Sixth Schedule i.e., it is administered by Autonomous District Councils and the local traditional governance system of Meghalaya. There are three District Councils in Meghalaya viz., Khasi Hills Autonomous District Council, Garo Hills Autonomous District Council and the Jaintia Hills Autonomous District Councils protecting the three major tribes of Meghalaya, which are the Khasi, Garo, and Jaintia tribes respectively.

Meghalaya is also the only Indian State where an un-constitutionalized, non-legally recognized unit of local governance system exists governing almost 97 percent of the state. Shillong Municipal Board administers only on an area of 10sq.km, which has been divided in 27 wards. The District Councils administers on the remaining 97% of the state in their respective districts excluding the Shillong Municipal Board and the Cantonment Board.

Shillong Planning Area falls under Khasi Hills Autonomous District Council, which governs all the Khasi Hills District and Ri-Bhoi District. The Governing and service delivery bodies are divided into two; the Constitutional or the state institutions and the traditional institutions. Each unit performs their designated functions in their respective jurisdictions. The traditional bodies work independently and sometimes in collaborations with the state actors.

## 10.3 CONSTITUTIONAL INSTITUTIONS

### 10.3.1 DEPARTMENT OF URBAN AFFAIRS

The main objective of the Department of Urban Affairs is to ensure proper planning and management of the urban areas with emphasis on provision of necessary infrastructure and civic amenities like water supply, roads, drainage, street lights, parks and play grounds to promote a clean and healthy living conditions in all urban centres of the State.

The Department is to formulate Policies and Programmes, in this connection coordinate, supervise, and monitor the implementation of the various schemes towards realization of the stated objectives.

Administratively, the Department is headed by the Commissioner and Secretary, and assisted by Secretary, 2 Directors, Officer on Special Duty, Under Secretary and other staff.

### 10.3.2 DIRECTORATE OF URBAN AFFAIRS

In 1990, the 'Directorate of Municipal Administration Cell' was merged with 'Directorate of Urban Development' and was redesignated as the 'Directorate of Urban Affairs'. The activities of the Directorate are confined to the urban areas of the State having the Municipalities and to those urban areas having Town Committees.

#### 10.3.2.1 FUNCTIONS

The Directorate of Urban Affairs is responsible to assist the Urban Affairs Department in administering the Meghalaya Town and Country Planning Act to ensure proper planning and management of the urban areas of the state with emphasis on provision of necessary infrastructure and civic amenities for healthy living conditions in all urban centers. Its main functions include

- Advising on Urban Development Policies and Strategy.
- Preparation of Master Plans for the towns for orderly growth and development under the Act.
- Formulation of Regulations for enforcement of development control according to the Master Plan.
- Surveying and mapping of towns and planning areas (including Aerial photography/Remote sensing)
- Preparation of Traffic and Transportation Plan and Schemes.
- Preparation of Utility Plans of Towns.
- Preparation of Slum Improvement Plans, Environmental Improvement Plans and Poverty Alleviation Action Plan of urban areas.
- Preparation of Development Project proposals.

- Guidance in and implementation of building regulation, sub-division of lands through layout plan.
- Execution of development works under the Centrally Sponsored and State Plan Schemes.
- Monitor and co-ordinate the activities of District level offices under the Directorate.
- Advice and assist the Municipal Boards, MUDA and MUDA in discharging their functions and duties and to monitor and co-ordinate the activities of these organizations.
- Providing technical assistance to other Government Department.
- Advice and assist the State Government on matter relating to Planning and Urban Development, Urban Management and Administration.

#### 10.3.2.2 ORGANIZATIONAL SET UP

- The Directorate of Urban Affairs is headed by the Director, Urban Affairs, Meghalaya and has been organized at State and District level. The Directorate of Urban Affairs is located at Shillong and the Director is assisted by 2 (two) Joint Directors, 1(one) Executive Engineer, 1(one) Architect, 1(one) Finance and Account Officer beside other Officers and staffs.
- At the district level, the Directorate has 10 (ten) sub ordinate Offices viz. Offices of the District Urban Planners at Shillong, Jowai and Tura, Offices of Executive Engineers at Shillong, Jowai and Tura and Offices of Assistant Engineer at Nongpoh, Nongstoin, Williamnagar and Baghmara responsible for planning and execution of development works.

#### 10.3.3 MEGHALAYA URBAN DEVELOPMENT AGENCY

The Centrally sponsored Urban Poverty Programmes i.e. Nehru Rozgar Yojana and Urban Basic Services Programme were launched in 1990 and as per the guidelines of these schemes, an Urban Development Agency at State level was to be constituted to act as nodal point for implementation of the poverty alleviation programmes. Hence, the MUDA was set up and registered in May 1991 as a Society under the Meghalaya Societies Registration Act, 1983.

##### 10.3.3.1 OBJECTIVES

- To draw up plans and assist local bodies/Municipal Boards/Town Committees in implementation, development of schemes relating to urban poor for improvement of their socio-economic condition
- Improvement of physical environment of the habitat
- Improvement of their quality of life

- Analysis and solution of specific problems encountered in planning and implementation of various development programmes
- Assisting the Government of Meghalaya in policy formulation, the choice of options and strategy for their up-liftment
- To undertake all such other lawful activities as are conducive or necessary to the attainment of the above objectives of promoting urban development in all its facets.

#### 10.3.3.2 MISSION

- Plan and assists the local bodies in implementation of schemes relating to the urban poor for development of physical, social and economic environment and thereby improving the quality of life,
- Facilitate the Boards in coordination and convergence of activities of various sectoral departments and
- Function as a nodal agency to channelize fund, monitor the proper utilization of fund, monitor and assess the programme and coordinate the schemes relating to urban poor.
- The organization functions as a nodal agency to channelize funds, oversee their proper utilization, monitor and evaluate the operation of programmes and coordinate the schemes relating to urban poor.
- This Agency is under the administrative control of the Department of Urban Affairs.

#### 10.3.4 MEGHALAYA URBAN DEVELOPMENT AUTHORITY (MUDA)

The Meghalaya Town and Country Planning Act was enacted in 1973 with a view to ensure the development of the towns and country side of the State on sound planning principles with the object of securing proper sanitary conditions to conserve and promote the public health, safety and general welfare of the people living in those areas.

The Act provided for setting up of Development Authority (section 8A). The Shillong Development Authority was constituted in March 1990 with its jurisdiction over Shillong Master Plan Area. Subsequently in 1991, its jurisdiction was extended to cover the whole State and was renamed as Meghalaya Urban Development Authority.

##### 10.3.4.1 FUNCTIONS AND DUTIES

- The MUDA is entrusted with the responsibility to promote and secure the development of the area according to the Master Plan (Section 8D).



- The Authority has also to prepare the Schemes in areas notified as scheme areas under the Act.
- Enforcement of Master Plan powers relating to land-use controls.
- The Authority have vested with the power to sanction erection, alteration or re- erection of any building to ensure that no construction takes place in violation of the provisions of the Master Plan.
- The Authority is also responsible for implementation of the Master Plan, land use and zoning regulation and the schemes, to impose reasonable restrictions on the use of the land and buildings including the regulating of the open space to be maintained etc.
- The Authority has to function as an umbrella body and is responsible mainly for co-ordination, sanction and monitoring of urban development schemes.
- This Agency is under the administrative control of the Department of Urban Affairs.
- This Agency is also responsible as the nodal agency for the implementation of the Jawaharlal Nehru National Urban Renewal Mission programmes and projects.

#### 10.3.4.2 COMPOSITION OF THE AUTHORITY

The Authority consists of a full time Chairman to be appointed by the State government. Other members include

- Deputy Commissioner of the District,
- Chairman of the local Municipality,
- Director of Town Planning,
- Public Health Engineer,
- Director of Health Services.

Three persons representing the areas lying outside the Municipality but within Master Plan area nominated by the State government and Two persons to be elected by the Commissioners of the Local Municipality from amongst the Council members. The Authority is empowered to borrow and receive grants, advances and loans.

#### 10.3.4.3 ORGANIZATIONAL SET UP

The organizational set-up of the Authority consists of broadly five branches Viz. the Planning and Design Branch, Engineering Branch, Finance and Accounts Branch, Monitoring Branch and Administrative Branch which are under the over-all administrative charge of the Chairman assisted by the Secretary and other Officials.

The Engineer-In-Chief heads the Engineering branch and is assisted by one Superintendent Engineer, two Executive Engineers, and 4 each of Assistant and Junior Engineers.

The Chief Urban Planner is in charge of planning and design branch and is assisted by one Urban Planner and Assistant Planner each with support staff.

At the District Level, the Town Planning Units at Tura and Jowai are manned by the respective District Urban Planners of Urban Affairs as Town Planning Officers.

### **10.3.5 PUBLIC HEALTH ENGINEERING DEPARTMENT (PHED)**

The main function of the PHED is to plan, implement and maintain Rural and Urban Water Supply and Rural Sanitation schemes. The District Level administration of the PHED undertakes field investigation, survey, data collection, preparation, execution and maintenance of schemes.

The PHED, at the secretarial level, is headed by one Principal Secretary, one Commissioner and Secretary and assisted by one Under Secretary. At the departmental level, it is by the Chief Engineer, PHED who is assisted by 5 (five) Additional Chief Engineer i.e. Add. Chief Engineer (PHE), Zone-I, Shillong, Zone-II, Tura, HRD Cell, Shillong, Sanitation Cell, Shillong and newly created Zone-III, Shillong.

The Zone-I comprises of Greater Shillong Circle and electrical Circle and the prestigious Greater Shillong Water Supply Scheme along with other schemes falling under the Circle are being looked after Add. Chief Engineer (PHE) Zone-I. Zone-II comprising of three Districts of Garo Hills, is looked after by the Add. Chief Engineer (PHE), Zone-II. The Urban and Rural Schemes pertaining to Tura Circle, covering entire Garo Hills areas are directly looked after by the Add. Chief Engineer (PHE), Zone-II.

Areas under Rural Circle, Shillong covering Ri-Bhoi District, West Khasi Hills District and most part of Jaintia Hills District and rest of East Khasi Hills District will be looked after by the newly created Additional Chief Engineer, PHE, and Zone-III. The administration at the District level is divided into Four Public health Engineering Circles and 17 Working Divisions covering the entire State under the administrative control of the Chief engineer.

### **10.3.6 PUBLIC WORKS DEPARTMENT (PWD)**

After attaining of statehood in 1972 from the erstwhile composite the PWD (R&B) of the State came into being and inherited the assets concerning roads, bridges, irrigation and flood control projects. Its functions are:

- To construct roads, bridges, irrigation and flood control projects as well as for their maintenance including administrative works etc.

- Construction of roads and bridges including their maintenance and other works relating to the same.

### 10.3.7 DEPARTMENT OF HOUSING

In 1972, the Department of Town Planning and Housing was established and this Department was bifurcated in the year 1982 to constitute Department of Housing. Its main objective consists of issuing of sanctions for the implementation of housing schemes in the State relating to Rural Housing, Rental Housing Schemes, Construction of Economically Weaker Section Houses and Land Acquisition and Development Schemes.

### 10.3.8 SHILLONG MUNICIPAL BOARD (SMB)

The SMB was constituted in 1908 and governed under the provisions of Meghalaya Municipal Act 1973 and Meghalaya Municipal (Amendment) Act 2000.

The municipal jurisdiction extends to 10.36 sqkm out of a total planning area of 174 sqkm. Elected council is absent since 1973. Since then a senior officer of the State government who is designated as Chief Executive Officer (CEO) is administering the Board.

#### 10.3.8.1 OBJECTIVES

To ensure the right to public health, efficient and quality basic services to all citizens, to provide a congenial environment, and to bridge the gap in the availability of urban services among the various sections of the society.

#### 10.3.8.2 MISSION

The Mission/Vision Statement of SMB is to

- Provide Hygienic services
- Regulate of trading license, hoardings and kiosks
- Registration of birth and death
- Facilitating up gradation of the means of livelihood and living standards of the urban poor.
- Providing equitable and efficient service to all citizens.

The Municipal Act envisaged that the Municipal Board would provide an efficient civic administration to the area under its jurisdiction by managing water supply, lighting, drainage, and sanitation and other civic amenities. The Act also provides for setting up funds for specific purposes including water and lighting, removal of sewerage and rubbish, public health administration including measures to control epidemics, construction, maintenance

and improvement of roads, bridges, squares, parks, Drains, latrines, etc. in the interests of the citizens living within the municipal area.

### 10.3.8.3 ORGANISATION

Presently, the Chief Executive Officer heads the organization and operates through two Executive Officers and other staff. The Municipal Board consists of 10 departments,

1. General Administration
2. License
3. Collection
4. Assessment
5. Health and Conservancy
6. Public works
7. Water Works
8. Accounts
9. Establishment and
10. Urban Poverty Alleviation Cell, which is a part of the Public Works.

### 10.3.8.4 DEPARTMENTS OF SMB

**Establishment Branch** - This department deals with all the personal files of all the Employees of the SMB and is actively involved in providing facilities and privileges to the employees of the Municipal Board.

**Assessment Branch** - The function of this Branch consists of

- To calculate taxes as per the annual value (AV) given by the PWD branch of the SMB for purposes of House Tax, Water Tax, Lighting Tax and Latrine Tax.
- Maintenance Demand and Bill Register for keeping the records of the details of all taxpayers and the amounts that the taxpayers have to pay. On average the Department prepares about 45-50 bills (approx.) per day.
- Dealing with Transfer / Mutation / Apportionment of holdings as applied by the ratepayers.
- Correspondence in regards to reviewing / reducing of municipal tax.
- Misc. such as issuing of certified copies of holdings as required by the ratepayers.

**License Branch** - The License Department performs four activities viz.

- License for pets: The License Department issues one-year license for pets (dogs and horses). The owners are provided with a ticket for a pet. The ticket holds the number, session, the names of the owner and SMB written on the top. The license fees are collected yearly.
- License for Stall: The License Department of SMB issues licenses to Municipal Market, Stakeholder on a yearly basis. The person using the stall has to pay the tax monthly.
- License for Parking Places and Tollgates: The License Department on contract basis issues One-year license to the Contractor for collecting the taxes for the Parking Places and Tollgates. Tenders are invited from the interested parties through advertisement in newspaper. The contract is for one year.
- License for Commercial establishment: The License Department issues one-year license for commercial establishments. Person who wants to set up a Commercial Establishment must have a trade license issued by the Chief Executive Officer (CEO) of the SMB.

**Collection Branch** - After the calculation of taxes by the Assessment Department, the Collection Department prepares the Bill and sends it to the holder or taxpayer. The Bill includes the previous balance, if any. The process of Tax Collection involves the collection of all types of taxes, administration fee, composition fee, mutation fee etc. It also receives information from other departments as License Department, Water Works Department of SMB etc. The collection department is the backbone of the SMB. The main objective is to generate income for the Board.

**General Administration Branch** - The main functions of this Department includes maintenance of a copy of building plan of each holding; Elections of Ward Commissioners; maintenance of training programs from Government and from private entrepreneur; dealings all the Government Correspondence, issues etc.

**Public Works Branch** - The Public Works Department of the SMB grants permission for construction of any residential/office building. It looks after the construction works of the municipality roads, Drainage system, Local Community Halls, etc. Without the permission from this department, the Shillong citizen cannot construct any building or so. The PWD also assess the Annual Rental Value (ARV) for any newly constructed buildings, which is used for the calculation of taxes in future.

There are mainly two divisions:

- a. Civil Division
- b. Enforcement Division

Civil Division looks after the construction works of the Municipality roads, drainage system, municipal buildings, local community hall, etc. Enforcement Division looks after unauthorized construction, assessment to tax of buildings, etc.

This branch also looks after Street lighting also. Since there is no permanent, electrical division an Electrician looks after this service. This branch is also entrusted with the responsibility of provision of Parking Spaces. For regulation of traffic congestion and to avoid haphazard parking the SMB provides designated parking places/ lots in areas like Laitumkhrah, Jail Road, Police Bazaar, Bara Bazaar, where a nominal fee for the service is charged.

The services provided include:

- Providing safe and clean parking space.
- Issue of receipts/tickets of payment for parking.
- Eviction of encroachers like hawkers etc. from the designated parking space.
- Removal of any destruction / nuisance in the parking space.
- Providing proper signs boards and regulation there of entry and exit and
- Parking for free moving of vehicles.

**Water Works Branch** - According to Meghalaya Municipal Act, every Municipal Board is required to provide or arrange for the provision of sufficient supply of drinking water for inhabitants of the areas within its jurisdiction. The main functions SMB are:

- To provide water connection from both municipal line and PHE line.
- Provision / maintenance of public taps.
- Maintenance, repair and cleaning of water sources, water tanks, water lines.
- Regulations of timings of water supply by designated key men.
- Provision of additional water supply by water tankers.
- Regulation of certified plumbers - issue of license, regulation of fees, etc.
- Inspection of wells, perennial water and declaration of closure of the same if found not fit for using and
- Tapping water resources.

**Health and Conservancy Branch** - According to the Meghalaya Municipal Act, Municipal Boards are required to provide for removal of sewage, rubbish and offensive matters from all public roads and all property vested in the Board and wherever latrine tax has been

imposed sewage and offensive matter and cleaning of all private latrines, urinals and cess-pools in the areas under their jurisdiction.

The main objective of the health department is to develop and maintain proper sanitation all across the city. As cleaning drive is the regular basic work, this department launches a special drive for cleanliness in the city during festivals.

This department also helps localities and non-Municipal localities during their cleaning drive by providing them labour, transport and machinery things.

Within the department a separate cell exists viz., Health Establishment to manage refuse collection and disposal services, which entrusted with the responsibility to

- Deploy sweepers for road sweeping in all roads, lanes and bye lanes of the city and of labourers for cleaning of drains and roadside herbs etc.
- Depute of garbage collectors for door to door collection of garbage from each household and of garbage vehicles for the door to door collection and
- Transport garbage for disposal at the designated compost plant site.
- Provide infrastructure for solid waste and liquid waste management like the garbage collection station, transfer stations, trashcans, municipal drains, etc.
- Ensure a safe cheap and hygienic system of sewage disposal through cesspool cleaner,
- Check and penalise violation of sanitation rule and laws through the polluters pay policy
- Issue of notices to the repairers regarding construction of septic tank, latrines, etc. and
- Human disposal of unclaimed dead bodies.

**Urban Poverty Alleviation Cell** - Largely caters to the needs of the Urban Poor through centrally sponsored scheme i.e. SJSRY, NSDP by providing gainfully employment to the urban employed poor through encouraging the setting up of self-employment ventures or provision of wage employment. The functions of the Cell are

- Assistance to the individual urban poor beneficiaries for setting up gain full employment venture.
- Assistance to groups of urban poor women for setting up gainful employment ventures through DWCUA.
- Training of beneficiaries for up gradation and acquisition of vocational and entrepreneurial skills.
- Assistance in the formation of thrift and credit society (SHG)

- Regular health checks ups for women and children.
- Nutrition program.
- Provides medicine aid to the poor.
- Regular health check-ups, some beneficial programs, medicine distribution to the poor, etc. are done in each municipal area through the co-operation of the neighbourhood community.

### 10.3.9 DISTRICT COUNCIL

The Sixth Schedule provides for the establishment of District Councils for autonomous district consisting of not more than thirty members, of whom not more than four persons are to be nominated by the Governor and the rest needs to be elected on the basis of adult suffrage. The administration of an autonomous district, vested in the District Council whose term of office is five years.

#### 10.3.9.1 POWERS

According to para 3 of the Sixth Schedule the District Council is empowered to make laws with respect to

- The allotment, occupation or use, or setting apart of land, other than any land which is a reserved forest for the purposes of agriculture or grazing or for residential or other non-agricultural purposes or for any other purpose likely to promote the interests of the inhabitants of any village or town.
- However, the State government is empowered to compulsorily acquire any land, whether occupied or unoccupied, for public purposes.
- The management of any forest not being a reserved forest
- The use of any canal or water-course for agricultural purposes
- The regulation of the practice of Jhum or other forms of shifting cultivation
- The establishment of village or town committees or councils and their powers
- Any other matter relating to village or town administration, including village or town police and public health and sanitation.
- The appointment or succession of Chiefs or Headmen.
- The inheritance of property.
- Marriage and divorce.
- Social customs.



- The District Council is empowered to establish, construct, or manage primary schools, dispensaries, markets, cattle pounds, ferries, fisheries, roads, road transport and waterways in the district
- Either the Governor may, with the consent of any District Council, entrust conditionally or unconditionally, to the Council functions in relation to agriculture, animal husbandry, the Governor may entrust community projects, co-operative societies, social welfare and village planning.
- Powers to assess and collect land revenue and to impose taxes.

Further, the District Council enjoys the power to levy and collect all or any of the following taxes viz.

- Taxes on professions, trades, callings and employments
- Taxes on animals, vehicles and boats
- Taxes on the entry of goods into a market for sale therein, and tolls on passengers and goods carried in ferries; and
- Taxes for the maintenance of schools, dispensaries or roads.

## 10.4 TRADITIONAL INSTITUTIONS

The traditional institutions are considered the highest authority by the local tribal of the state but after advent of District Council, the powers of the traditional institutions diluted. The traditional institutions operating in the Khasi Hills are detailed below. These same institutions also govern Shillong Planning Area in the similar hierarchy.

### 10.4.1 DORBAR HIMA

The Dorbar Hima or the State Assembly is presided by Syiem who is the chief of a tribe who rules a Hima or a kingdom that consists of a number of villages. Representation at the Hima and Raid level is rigid. Syiem can be elected only from the Syiems' family or its legitimate branch. The electoral council consists of Council members and other Heads of Clans. In some cases, the Heads of Clans propose the names of the candidates and the people choose the Syiem.

#### 10.4.1.1 FUNCTIONS

- Construction and maintenance of roads, bridges, water sources and sanitation
- Establishment of and maintenance of markets and collection of dues
- Welfare works and community services
- Judicial powers to settle petty disputes/cases;

- Organize cultural festivals.

The Syiem receives their letter of authorization from KHADC and the Rangbah Shnong or the Village Headmen receive their letter of authorization from The Syiem in the form of 'Sanad'.

### 10.4.2 DORBAR SHNONG

The Dorbar Shnong is the most trusted and important unit of governance for the locals. In villages, where the municipal board and the other state institutions cannot function, the Dorbar Shnong takes all the responsibility of governance and service delivery independently or with the help of line departments. Each Village or Area has a Shnong, headed by a Rangbah Shnong (Headman) who is elected by voice vote of the villagers. Other members are elected in a similar manner. Election is endorsed under the guidelines of the tribe. Term of office vary from Dorbar to Dorbar. It enjoys no legal or constitutional status.

#### 10.4.2.1 FUNCTIONS

- Looking after the law and order of the Shnong.
- Maintaining the common properties of the village
- Ensuring the delivery of urban services, which are done in cooperation with the SMB and related State Government departments.
- Implementation of MLA schemes and other government schemes.
- Providing services like water supply, solid waste management, streetlights and building smaller roads, bridges drains etc., in non-municipal areas.

Dorbar Shnong has limited funds, which include fines imposed, contributions, duties from the households to meet general expenses, and funds from MLA fund for development works.

### 10.4.3 DORBAR DONG

A Shnong, constituted by many Dongs or smaller localities that are in charge of a Rangbah Dong. The Rangbah Dongs forms a part of the council of Dorbar Shnong and their main responsibility is to assist the Rangbah Shnong and to manage the law and order of their neighbourhood or locality.

#### 10.4.3.1 FUNCTIONS

- Collection of taxes
- Maintains the discipline of the area.
- Resolve disputes

- Assists the Dorbar Shnong in providing urban services.

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## 11 HAZARD ZONATION

Shillong Planning Area (SPA) is characterized by core intensely developed area harbouring all activities- as a commercial centre, an educational hub, an administrative unit, a tourist area and many more. There is an increase in the horizontal as well as vertical growth of the area thus making it vulnerable to a large number of natural as well as man-made disasters. Earthquake, flood, landslide, thunderstorm (associated with strong wind, lightning, hailstorms and cloudbursts), cold wave, fire, and climate change impact on hydro meteorological hazards. The city is located in the highest seismic zone V that is also a very high earthquake risk zone category as per the BMTPC Atlas (2006). Shillong city lies on the Shillong Plateau. The Shillong Plateau experienced the 1897 Great Assam Earthquake (also known as 1897 Shillong earthquake) of magnitude 8.1 and heightened seismicity from 1869 to 1950. Since 1951, the city and nearby areas have been experiencing moderate to high level of seismicity. In spite of the moderate to high levels of seismicity observed in and near Shillong in the last 65 years, it cannot be said that higher intensity earthquakes (VIII and above) are unlikely as the region has a potential for large to great magnitude earthquake.

Shillong city is less prone to landslides as compared to its neighbouring areas, including the approach roads to the city. The city experiences most of the landslides during the monsoon that cause damages to houses, roads, and sometimes to agricultural land. However, the potential of earthquake-triggered landslides cannot be ruled out, as the region has a potential for very strong earthquakes. Thunderstorms / hailstorms in Shillong are vigorous and widespread with heavy downpours in a short-duration. This resulted in higher probability of flash floods in terrains with steep slopes in Shillong and the entire East Khasi Hills district in a warmer atmosphere. The city witnesses flash floods during the monsoon season, due to high intensity rainfall for prolonged hours. This causes water to overflow the banks in most of the streams causing flooding in localities in the vicinity of these streams. The city drains are not in good shape at many places along the roadside. At several places, rainwater simply flows along the roads and many of the roads are without any drains. Floods and water logging in the low-lying areas of the city have also become common due to unplanned growth of the city. The south-west monsoon contributes a considerable portion of heavy rainfall in both onset and withdrawal phases, which generally lead to flash floods in a short time. Encroachment and clogging of the channels are the major causes of flooding. The building of settlements in the floodplain has choked the natural flow of the river, thus causing water logging and submergence of low- lying area.

The term "hazard" refers to any physical phenomenon that could threaten life, property, or economic resources. In general, there are two categories of hazards: natural and man-made. It is becoming more and more challenging to distinguish between hazards that are caused by humans and those that are natural. Some hazards, like flooding and drought, are inherent but are made worse by human activity. A disaster occurs when a hazard strikes a susceptible population, causing damage, casualties, and disruption.

When the extent of hazard and vulnerability is low, the resulting disaster will also be of small magnitude. When the extent of hazard is high but vulnerability is low then the disaster will be of small magnitude. When the vulnerability is high but the extent of the hazard is small then the resulting disaster will also be of small magnitude. When the extent of hazard is very high and the vulnerability is also high then it will result in a huge disaster.

### What is the need for Hazard zonation?

Hazard zonation is essential for identifying and mapping areas prone to natural or human-made disasters. It guides urban planning decisions, ensuring sustainable development in vulnerable regions. In emergencies, it aids in effective response planning, including evacuation and resource allocation. Zonation contributes to resilient infrastructure design, public safety protocols, and environmental protection measures. Additionally, it informs insurance assessments, fostering community awareness and regulatory compliance for safer and more prepared communities.

## 11.1 OVERALL METHODOLOGY

The approach is divided into three sections due to the unique nature of work which encompasses a multi-hazard component as well as vulnerability and risk assessment.

- Collection of baseline data and historic hazardous/ disaster events under the hazard scenario development phase.
- Flood, Landslide, and Lightning hazard zonation maps using suitable techniques.

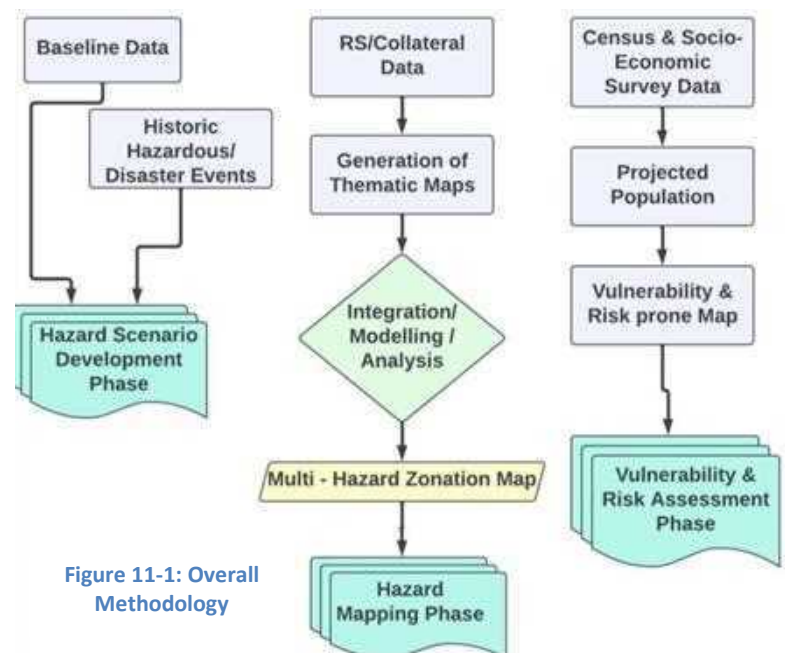


Figure 11-1: Overall Methodology

Using standard analysis techniques, assess socio-economic and population vulnerability and create risk maps as well as a report for the research region.

## 11.2 DATA INTEGRATION AND RESULT

### 11.2.1 SLOPE

The topography of the Shillong Planning Area is intricately detailed through a gradient of slope categories, each revealing its distinct land area. This dataset as shown in *Table 11-1 and Figure 11-2* delineates the relationship between slope inclination, measured in degrees, and the corresponding spatial expanse, measured in square kilometres.

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA

SLOPE MAP

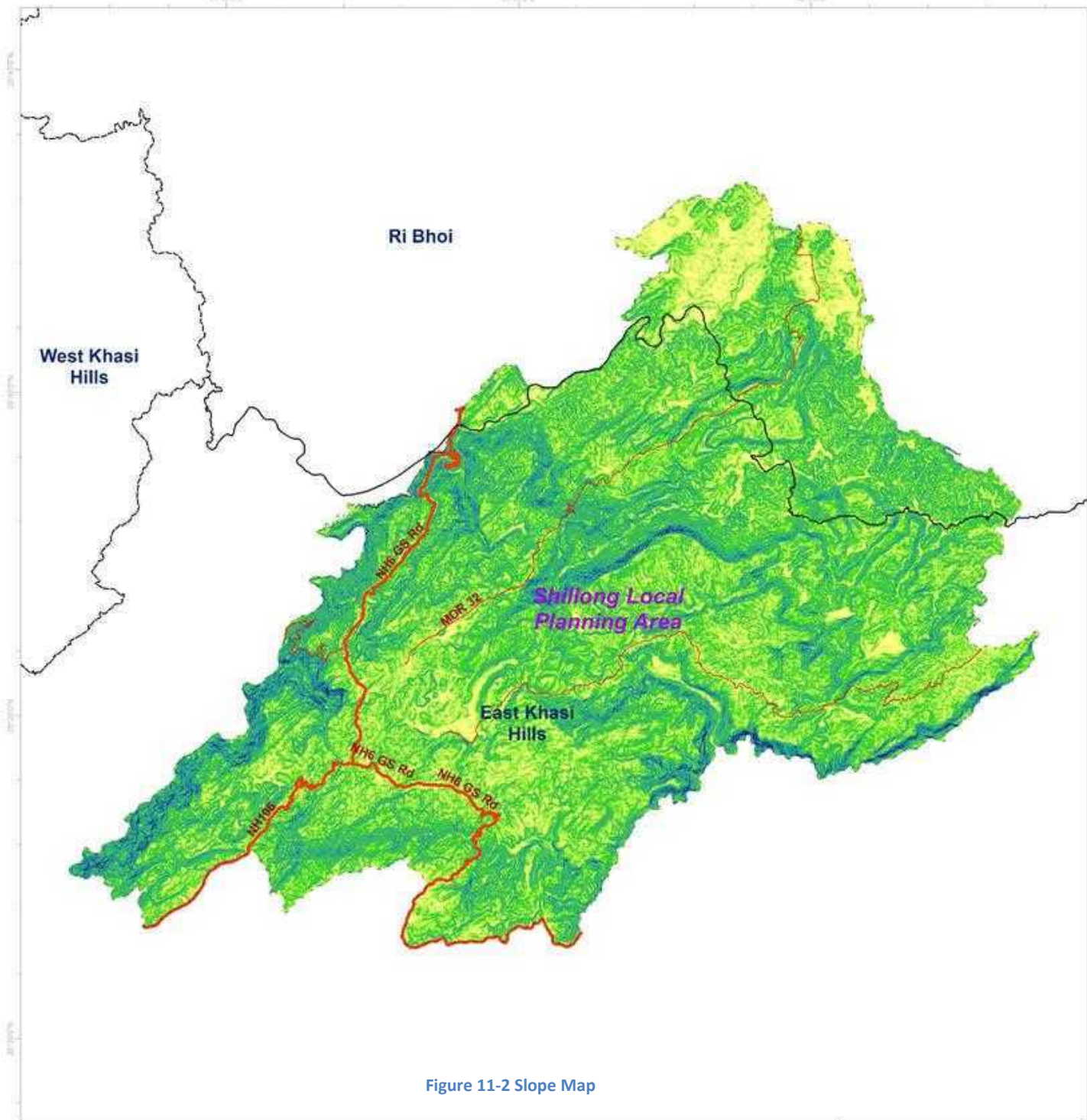


Figure 11-2 Slope Map

Legend

Baseline Info.

- National Highway
- State Highway
- Major District Road

Administrative Boundary

- District Boundary
- Planning Boundary
- Planning Area Boundary

Slope

- 0 - 5
- 5.01 - 10
- 10.01 - 15
- 15.01 - 30
- 30.01 - 40
- 40.01 - 50
- >50

Scale - 1:75,000



KEY MAP



Table 11-1: Categories of Slope

Slope (Deg)	Area (Sqkm)
< 5	39.76
5-10	66.43
10-15	58.75
15-30	102.05
30-40	17.75
40-50	3.2
> 50	0.53
<b>Total Planning Area</b>	<b>288.5</b>

In a hilly area, the landscape unfolds with diverse slopes, each presenting unique challenges and opportunities for land use and planning. The gentle slopes, covering approximately 164.94sqkm, feature subtle undulations and provide expansive spaces suitable for a variety of land-use purposes. Steeper slopes, ranging from 15-30 degrees and spanning 102.05sqkm, exhibit more pronounced elevation changes, necessitating careful planning to navigate potential constraints and capitalize on opportunities. Transitioning to steeper gradients, the 30-40 degree slopes cover 17.75sqkm, indicating heightened topographic complexities.

In the category of 40-50 degree slopes, occupying 3.2sqkm and termed as "**Regulated Slope**". **Restricted Slope/No Construction Zone** (>50°) the most precipitous slopes, constitute a minimal 0.53sqkm. These areas are particularly rugged and are preserved in their natural state due to the extreme terrain.

The dataset serves as a one of the foundational tool in suitability assessment chapter for determining the optimal sites in land use planning.

### 11.2.2 HILLY & VALLEY REGIONS

The delineation of hilly and valley regions is based on a geographical criterion in which areas with slopes less than 5 degrees encompass 39.5 sqkm, while those with slopes greater than 5 degrees covers about 249 sqkm, as shown in *Figure 11-4*.

### 11.2.3 SEISMIC HAZARD

As per the preliminary study conducted, probabilistic seismic hazard values in and near Shillong city of about 0.38 g corresponding to 10% probability of exceedance in 50 years (475 years return period) at base rock level. The study clearly indicates that PGA values are almost the same for the entire city, while, in reality, different parts experience different levels of ground motion due to local soil conditions. Local soil conditions can significantly affect earthquake ground motion of an earthquake. The soil's top layers act as filters that can modify the ground motion as a function of their dynamic characteristics. Soft, weak soils



tend to amplify long-period seismic motions and thus generally impart large ground displacements to structures, while very stiff soil and rock tend to de-amplify the ground.

Using AHP model, site response of earthquake was performed by giving criteria rank and layer weight. Based on the result of the obtained susceptible map (Figure 11-3) of Shillong, 23.88% of the total area found in low susceptibility. Whereas 4.58% of the total area found in very high susceptibility. Medium and high susceptible zones make up to 34.35%, 25.63% and 11.56% of the total area respectively. The result determines the area along the National Highway and near the Umshyrpi River consists of very high Earthquake site response and ward no 12, 15, 16, 17, 18, 25, and 26 has highly. Whereas low susceptible area incorporates the areas of Mawpat, Laithkor, Mawlong, etc.

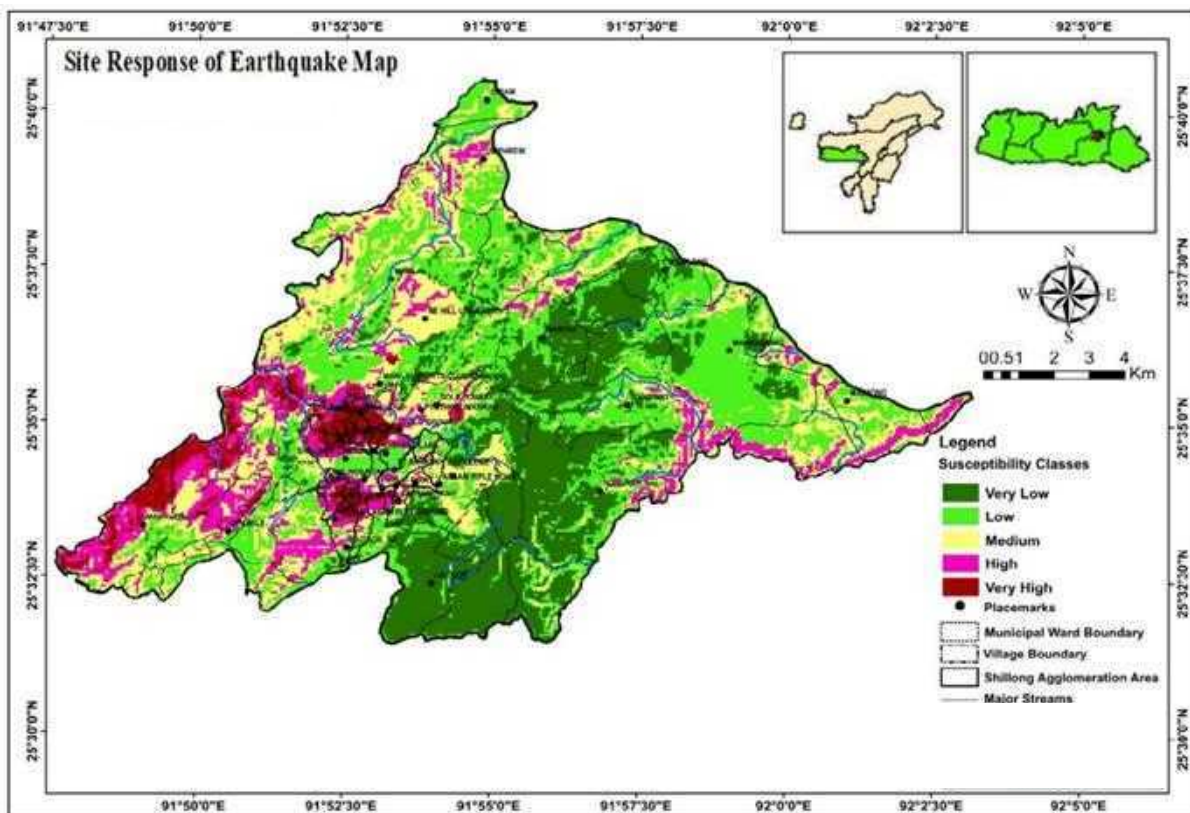


Figure 11-3 Site Response Earthquake Map

#### 11.2.4 URBAN FIRE HAZARD

In Shillong city, the old buildings are made up of wood. Some of the new buildings as well the flooring of these buildings is also made up of wood. Certain localities of the city are very congested and the density of population is also very high. In such congested localities, fire incidences are very common. Every winter household fires take place due to overheating, electrical faults, burning of charcoal etc. The narrow roads in the city make the operation of dousing fires challenging in case of fire incidents. Historical event data shows that the occurrence of fire events is higher in commercial buildings as compared to residential and industrial buildings.

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**HILLY AND VALLEY REGIONS**

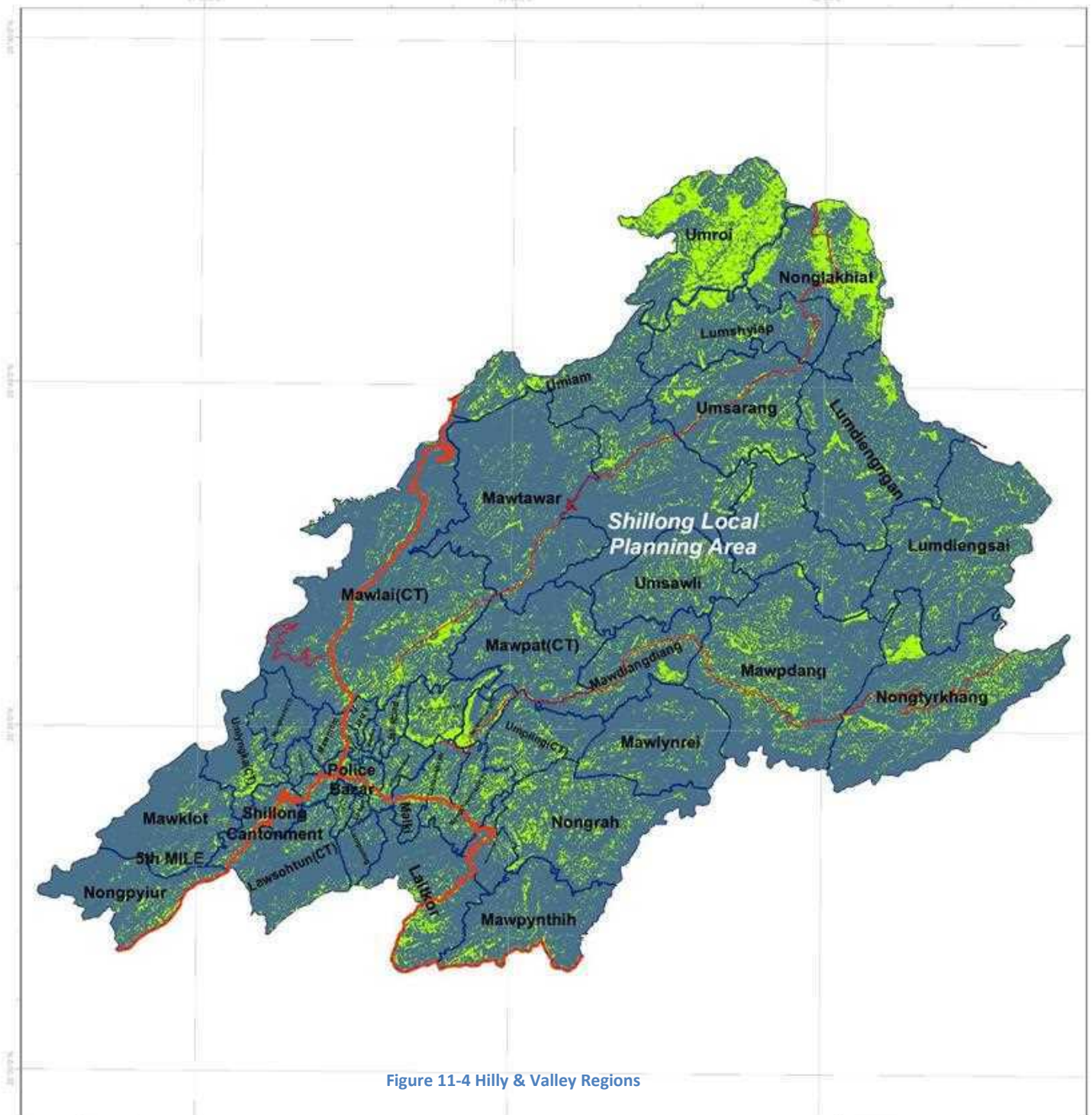


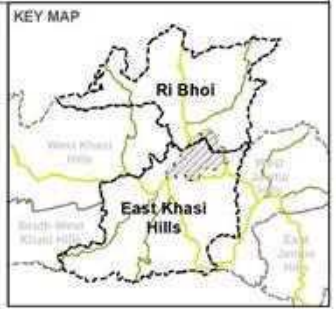
Figure 11-4 Hilly & Valley Regions

- Legend**
- Baseline Info.**
- National Highway
  - State Highway
  - Major District Road
- Administrative Boundary**
- District Boundary
  - Planning Boundary
  - Planning Area Boundary
  - Planning Districts
- Scale - 1:70,000**

**Slope in Degrees**

- Valley Region (<math>< 5^\circ</math>)
- Hilly Region (>math>5^\circ</math>)

0 1.25 2.5 5 Kilometers



### 11.2.5 LANDSLIDE SUSCEPTIBILITY

Shillong is comparatively lower susceptibility to landslides in contrast to other regions in Northeast India, including the access routes to the city. The landslides in the Shillong Planning Area occur during the monsoon season, leading to damage to residences, roads, and occasionally agricultural land.

Utilizing the Analytical Hierarchy Process (AHP) model, a Landslide Susceptibility Mapping (LSM) was conducted by assigning ranks and layer weights to specific criteria. The Landslide Susceptibility Index (LSI) incorporates numerical information, with higher values indicating greater susceptibility and lower values indicating lower susceptibility. The LSI values were categorized into five zones: "Very Low," "Low," "Medium," "High," and "Very High." *Figure 11-5* visually represents the areas falling within the high and very high susceptibility zones with inventory.

**Landslide Inventory:** Pockets of unstable slopes may be within Shillong Town. So, identification of such pockets is very much essential. The NERDRR portal serves as a repository for landslide locations in the North Eastern region. *Figure 11-5* shows the inventory data for planning area, for an in-depth analysis of their spread across Meghalaya, one can refer to the annual reports from 2020 to 2023. It's crucial to remember, though, that these locations only include reported events and may not cover all landslide incidents. This work plays a pivotal role in reducing the impact of landslides and safeguarding regions susceptible to such natural calamities. By understanding these incidents and their distribution, effective strategies can be devised to ensure the safety of the inhabitants of these regions. This significantly contributes to disaster management and the wellbeing of the people in these areas.

Cont...

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
LANDSLIDE SUSCEPTIBILITY WITH INVENTORY DATA

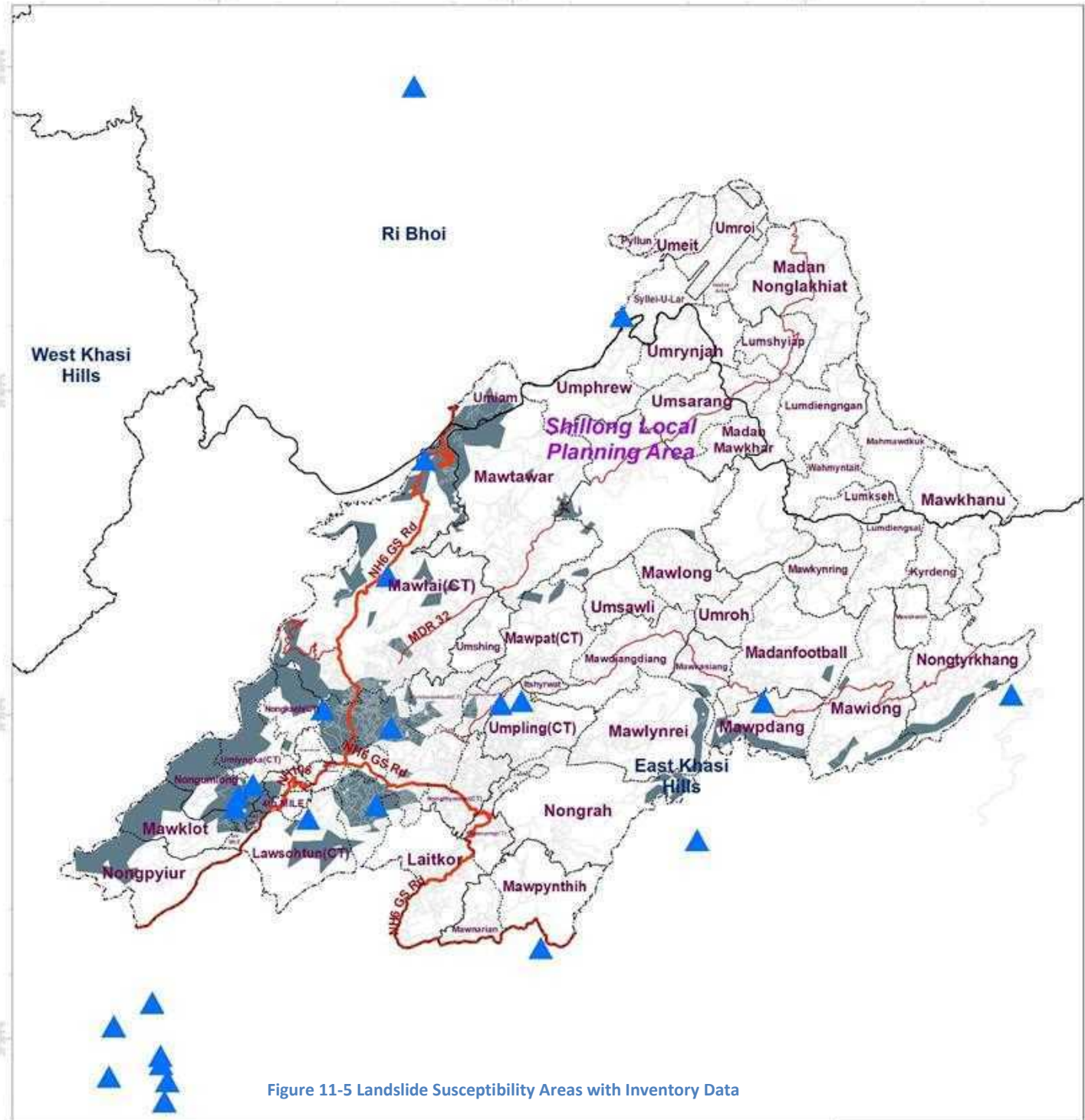


Figure 11-5 Landslide Susceptibility Areas with Inventory Data

**Legend**

- |                       |                                |                            |
|-----------------------|--------------------------------|----------------------------|
| <b>Baseline Info.</b> | <b>Administrative Boundary</b> | Landslide Pts              |
| National Highway      | District Boundary              | Landslide Susceptible Area |
| State Highway         | <b>Planning Boundary</b>       |                            |
| Major District Road   | Planning Area Boundary         |                            |

Scale - 1:75,000



### 11.2.6 FLASH FLOOD PRONE AREAS

One of the disasters that affect the city is flash flooding. The city witnesses flash floods during the monsoon season, due to high intensity rainfall for prolonged hours. Other important factors responsible for flooding in the city are the clogging of drains and insufficient capacity of the rivers flowing through the city area. Due to heavy downpours during the monsoon season, the water tops the banks along most of the streams causing flooding in localities in the vicinity of these streams. This is aggravated by a drastic reduction in channel capacities in most streams due to encroachments along their banks by buildings. The city is drained mainly by the upstream reaches of Wah Umiam, Wah Umkhen, and Wah Tamdong Rivers. Most of the drainage lines in the area are first, second, and third order reaches of these rivers.

Based on the result of the obtained flood susceptible map of Shillong (Figure 11-6), 18.38% of the total area found in very low susceptibility. Whereas 1.01% of the total area found in very high susceptibility. Low, medium, and high susceptible zones make up to 55.44%, 20.5% and 4.67% of the total area respectively. The areas of Polo Market, Pynthorbah, Nongrim hills, Dhankheti is a highly potential for flash flood of municipal area of Shillong. Low lying areas in the north western part of Umiam also showing probability for flash flood. Encroachment and clogging of channels are the main causes of flooding over Shillong.

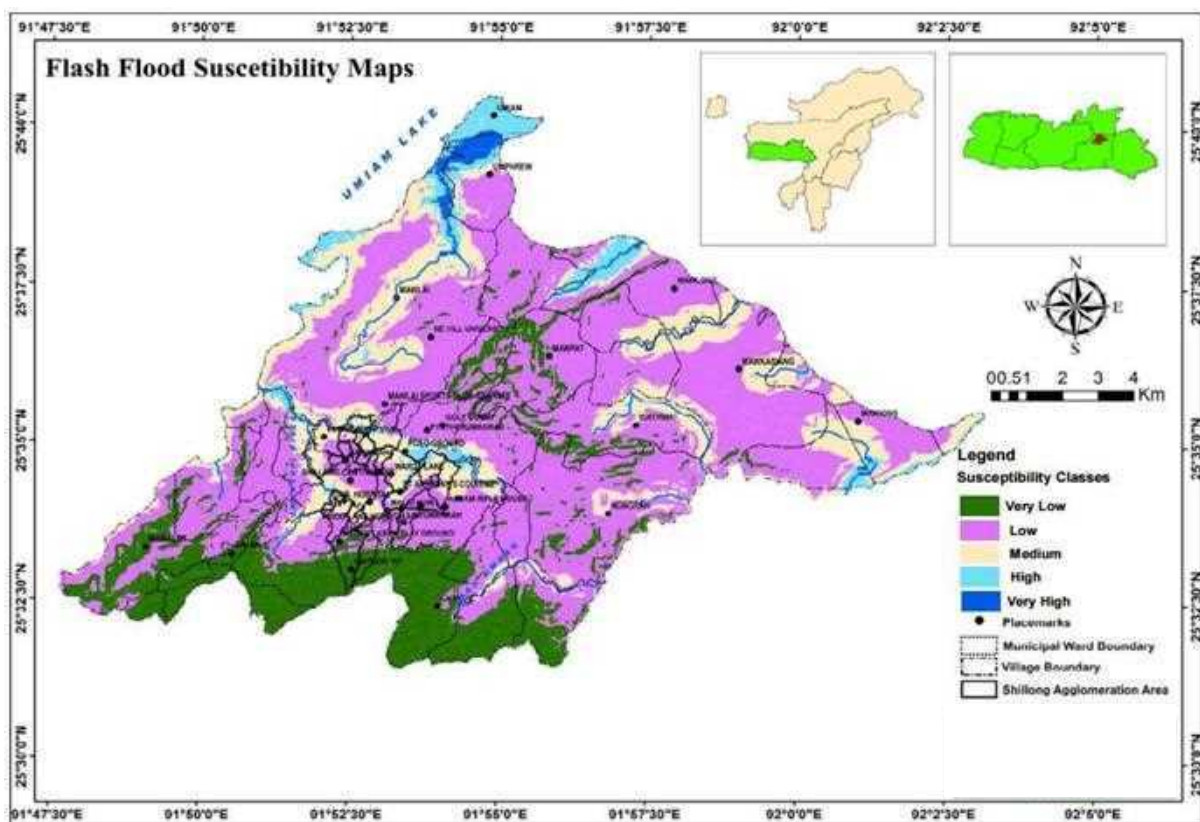


Figure 11-6 Flash Flood Prone Areas

### 11.2.7 LIGHTNING/ THUNDERSTORM HAZARD AREAS

Lightning events indicate climatic variation and severe weather and are needful for fertilization by the production of 'NOx.' On the contrary, they are dangerous by direct and indirect hits to humans and enhance property loss. Recently, National Crime Report Bureau (NCRB) mentioned more than 1500 hundred fatalities due to lightning over India and around 50-60 in the North-eastern region of India. Based on the known fact, all the lightning flashes are not harmful to humans as they occur in clouds and never reach the earth's surface, known as intra-cloud (IC) lightning flashes. On the other hand, some reach the ground called cloud to ground (CG) lightning flashes out of all the lightning flashes. These CG lightning flashes become hazardous for the public, telecommunication, and outdoor activities.

The present study focuses on the entire Meghalaya, whereas the data is been extracted for Shillong Planning Area. Based on the hazards mapping, we found that planning area lies in the moderate level of lightning activity (Figure 11-8). The Hazards Map, based on three years of Earth Network Total Lightning Network (ENTLN) averaged CG data from 2017 to mid-2020.

### 11.2.8 SEISMIC VULNERABLE AREAS

As per the report by CSIR-NEIST, "Site Characterisation and Seismic Vulnerability studies of Shillong".

Different types of data are integrated to find out the seismic vulnerability of sites to earthquake ground motion. Due to non-availability of detailed

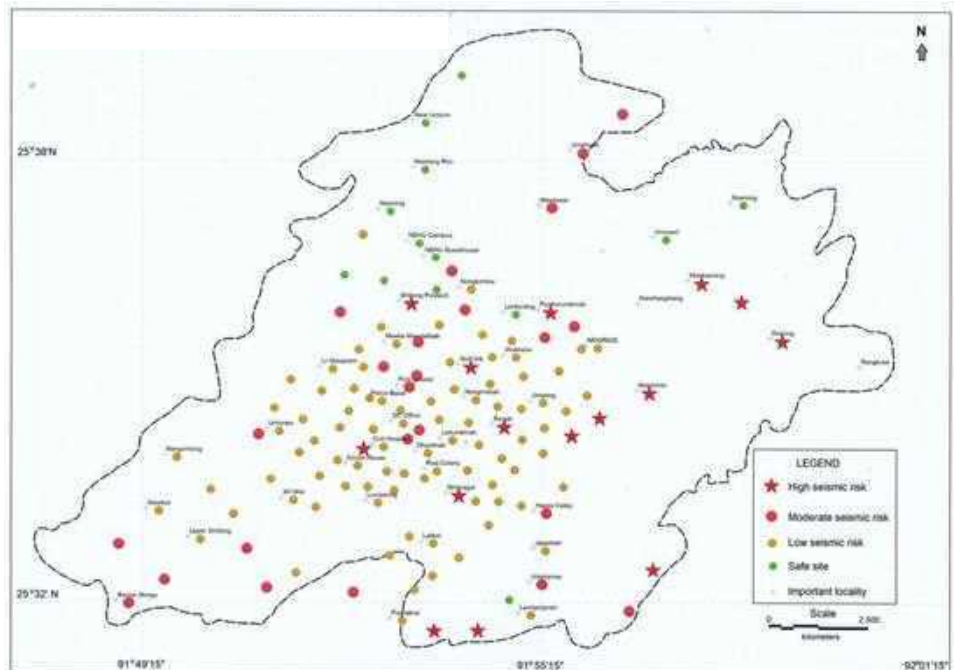
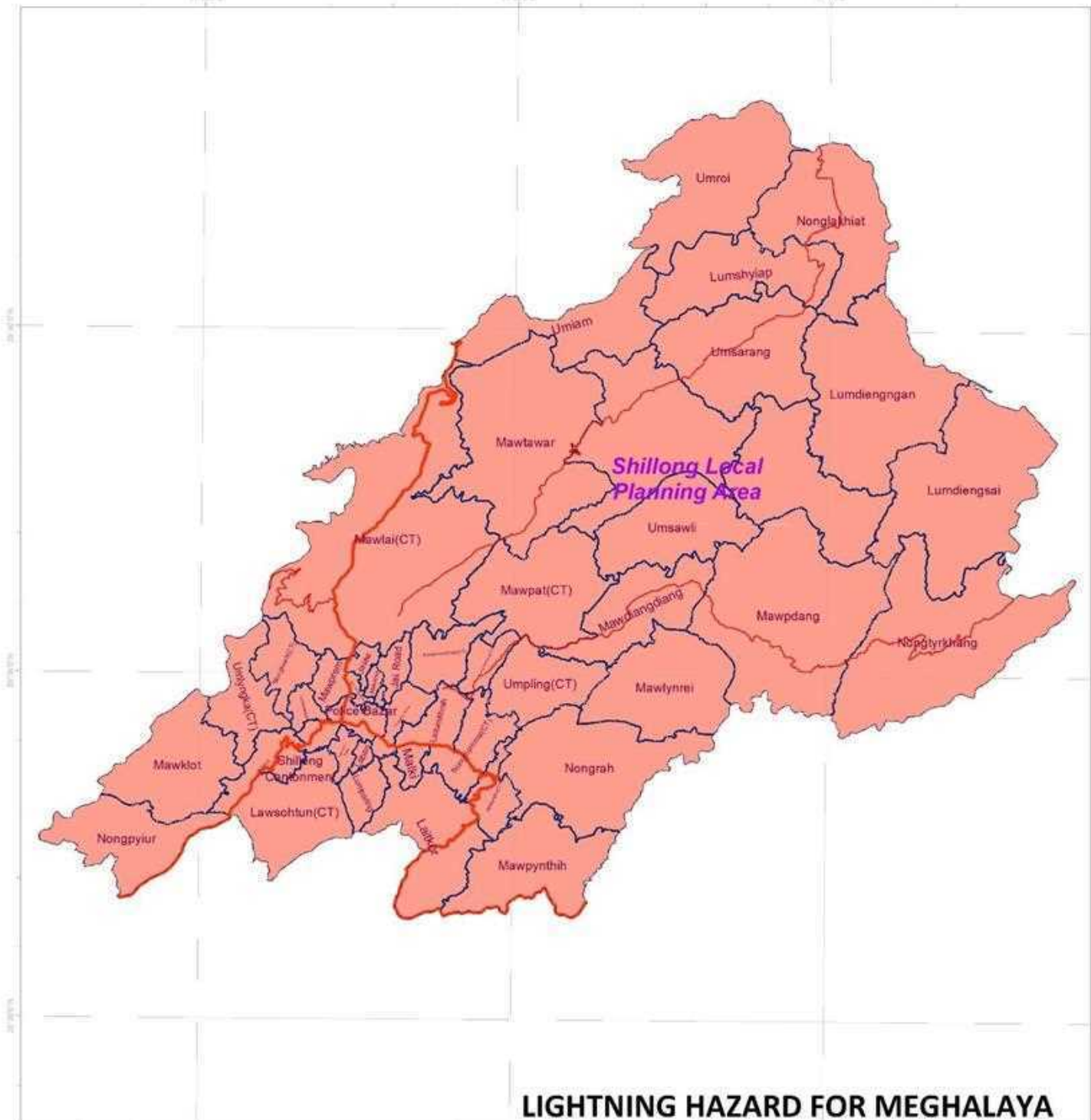


Figure 11-7 Seismically Vulnerable and Safer sites of Shillong

lithological information as well as hydrological information of the sites we had to depend mostly on ambient noise data and overburden thickness estimated using GPR data to assign degree of seismic vulnerability. In greater Shillong area it is observed that most of the sites come within low seismic risk category. In fact, 88 out of 146 sites are seismically of low-risk level. On the other hand, 15 sites area identified with high seismic risk, 24 sites with moderate seismic risk and 12 sites as seismically safe. Figure 11-7 shows seismically vulnerable and safer sites in Shillong area.

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA

LIGHTNING HAZARD



LIGHTNING HAZARD FOR MEGHALAYA

**Legend**

**Baseline Info.**

- National Highway
- State Highway
- Major District Road

**Administrative Boundary**

- District Boundary

**Planning Boundary**

- Planning Area Boundary
- Planning Districts

**Scale - 1:70,000**

**Lightning Hazards**

- Low
- Medium
- High
- Severe
- Very Severe

0 1.25 2.5 5 Kilometers

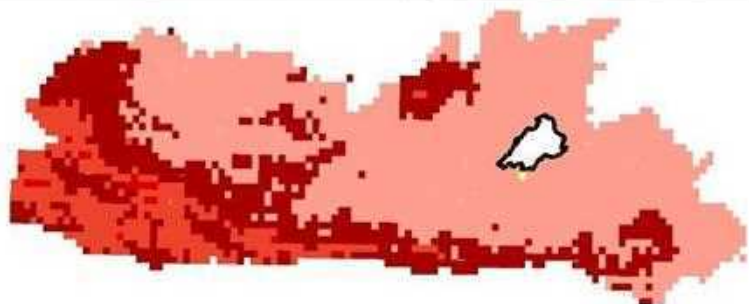


Figure 11-8 Lightning Hazard Areas



## 12 PROPOSED LAND USE

### 12.1 PLU FOR LOCAL PLANNING AREA

Individual suggestions are expressed in the independent chapters, as outlined in the preceding chapters. All of the proposals are based on public participation, land suitability assessments, and resilience to disasters.

Table 12-1: Proposed Land Use (2041) of SPA

SNO	CATEGORIES	Area (Sq.km)	%age
1	Residential	64.09	36%
2	Commercial	6.91	4%
3	Mixed	29.89	17%
4	Industrial	7.93	4%
5	Public & Semi-public	21.46	12%
6	Public Utilities	1.56	1%
7	Transportation	15.89	9%
8	Township	6.44	4%
9	Defense Area / Military Zone	7.57	4%
10	Recreational/ Green Buffer/ NDZ	17.75	10%
<b>Total Conurbation Area</b>		<b>179.49</b>	
11	Agriculture & Allied Activities	72.56	25%
12	Water Sheet	3.29	1%
13	Forest Area	19.11	7%
14	Hazards Prone Area	14.06	5%
<b>TOTAL PLANNING AREA</b>		<b>288.51</b>	

The *Table 12-1* shows the percentage distribution of different categories within the Conurbation Area. The Conurbation Area includes urban and suburban areas that have grown together to form a continuous urban landscape. In total, the planning area covers 288.51km<sup>2</sup>, with the conurbation area covering 179.49km<sup>2</sup>, or 62% of the total area.

The largest category of land use is residential, which covers 64.09km<sup>2</sup>, or 36% of the total Conurbation area. This is followed by mixed, covering 29.89km<sup>2</sup>, or 17% of the total area. Agriculture and allied activities cover 72.56km<sup>2</sup>, or 25% of the total area, while forest area covers 19.11km<sup>2</sup>, or 7% of the total area.

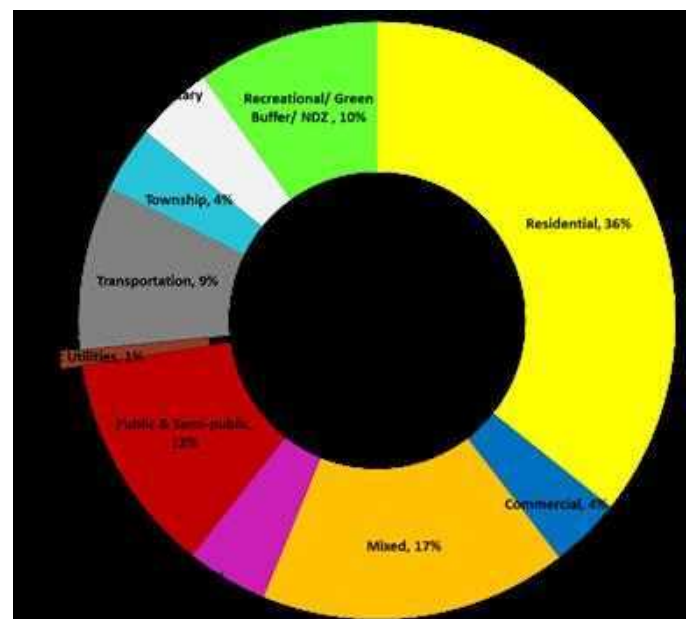


Figure 12-1: Percentage Distribution of Proposed Land Use (2041) of SPA



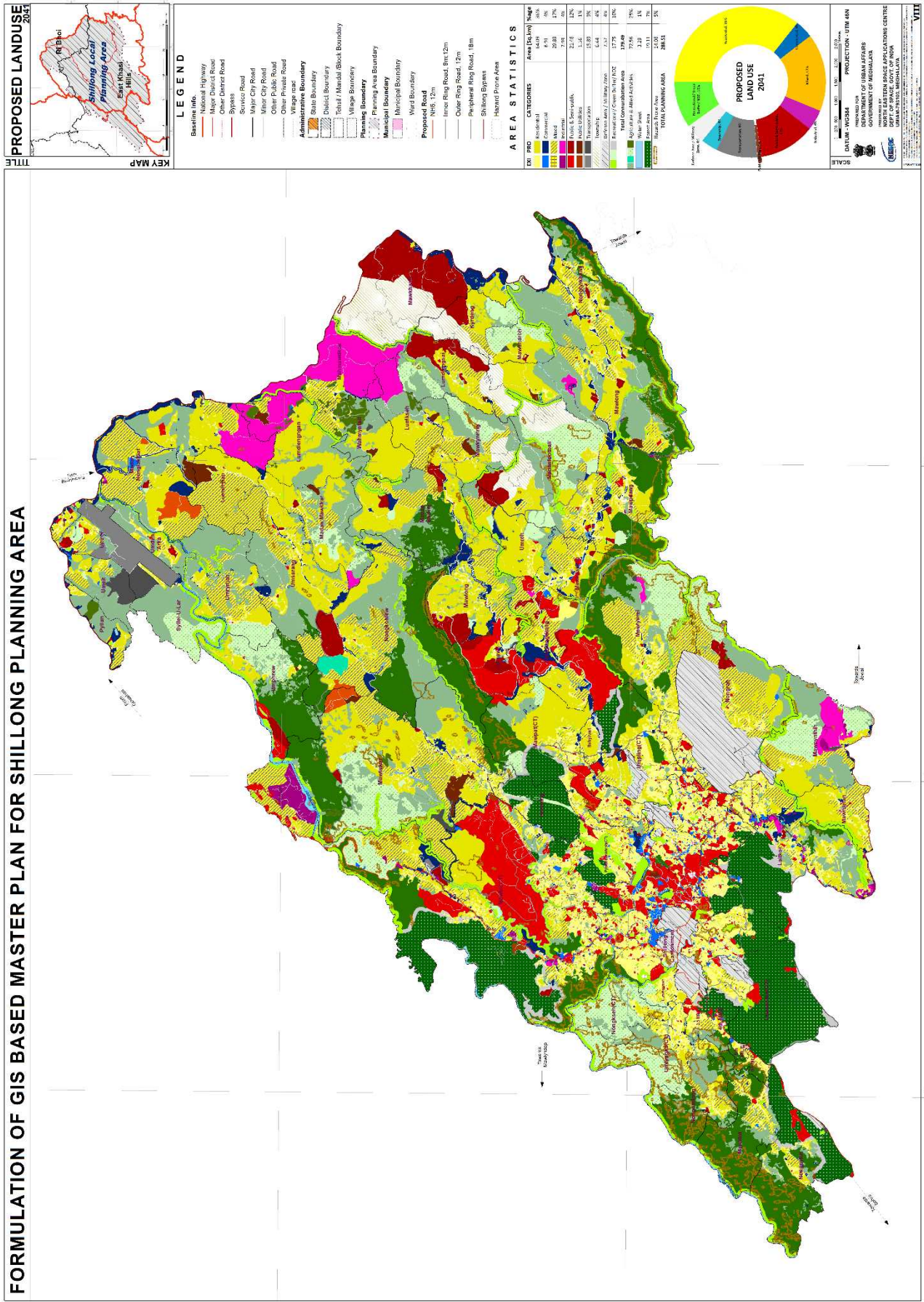


Figure 12-2: Proposed Land Use (2041) of SPA

## 12.2 COMPARATIVE AREA STATISTICS OF EXISTING & PROPOSED LAND USE FOR SHILLONG PLANNING AREA

Table 12-2: Comparative Area Statistics of Existing & Proposed Land Use for SPA

SNo	CATEGORIES	Existing Area Distribution (Sqkm)	Existing Area percentage	Proposed Area Distribution (Sqkm)	Proposed Area percentage
1	Residential	19.96	6.92%	64.09	22.21%
2	Commercial	1.31	0.45%	6.91	2.40%
3	Mixed	0	0	29.89	10.36%
4	Industrial	1.21	0.42%	7.93	2.75%
5	Public Utilities	0.27	0.09%	1.56	0.54%
6	Township	0	0.00%	6.44	2.23%
7	Public & Semi-public	12.93	4.48%	21.46	7.44%
8	Unclassified (Defence)	7.57	2.62%	7.57	2.62%
9	Transportation	7.56	2.62%	15.89	5.51%
10	Tree Clad Area	34.45	11.94%	0	0.00%
11	Recreational/ Green Buffer/ NDZ	9.42	3.27%	17.75	6.15%
12	Barren Land/Fallow Land/Scrub Land	46.6	16.15%	0	0.00%
13	Agriculture & Allied Activities	47.46	16.45%	72.56	25.15%
14	Water Sheet	3.29	1.14%	3.29	1.14%
15	Forest Area	19.11	6.62%	19.11	6.62%
16	Dense Tree Clad Area	74.66	25.88%	0	0.00%
17	Hazards Prone Area	2.71	0.94%	14.06	4.87%
	<b>TOTAL PLANNING AREA</b>	<b>288.51</b>	<b>100.00%</b>	<b>288.51</b>	<b>100.00%</b>

The proposed land use plan outlines a significant transformation in the distribution of various land categories. Notably, there is a substantial increase in the allocation of space for residential areas, rising from 6.92% to 22.21%. Similarly, the commercial sector is set to expand from 0.45% to 2.4%, and industrial areas are proposed to increase from 0.42% to 2.75%. Introducing a new township area of 2.23% is also a key feature of the plan.

In contrast, the proposed plan envisions the elimination of barren, fallow, and scrub lands, reducing their percentage from 16.15% to 0%. Additionally, there is a deliberate effort to enhance recreational, green buffer, and non-development zones, with their area expanding from 3.27% to 6.15%.

Overall, the overarching goal of the proposed land use plan is to augment residential, commercial, and industrial spaces while simultaneously safeguarding forested and agricultural lands. This strategic realignment aims to accommodate growth and development while prioritizing environmental conservation and sustainable land use practices. (Table 12-2).

Net population density and gross population density are two distinct metrics that provide insights into the distribution of people in a given area. Gross population density measures the total population within a specific geographical area, typically expressed as the number of individuals per square kilometer. On the other hand, net population density accounts for the urban or habitable land area within the same geographical boundaries, excluding uninhabitable areas like mountains, forests or bodies of water.

Both these metrics play a crucial role in shaping the lives of citizens. High gross population density often correlates with increased demands on infrastructure, services, and resources, potentially leading to congestion and strain on the environment. In contrast, net population density offers a more nuanced perspective by considering only the habitable land, which can provide a more accurate reflection of the actual living conditions. Understanding these density metrics is vital for urban planning, resource allocation, and sustainable development, as they directly impact the quality of life for citizens, influencing factors such as access to amenities, transportation, and overall well-being.

Fixation of density norms should be based on carrying capacity analysis focusing on parameters - space per person, access to facilities, available piped water per capita, mobility and safety factors. The task should be settlement specific. However, for overall planning approach density ranges from 60 -90 persons per hectare for medium Hill towns as per URDPFI guidelines.

The proposed gross population density is 22.4 persons per hectare, whereas the net population density achieved is 64 persons per hectare, and is well contained within the prescribe range of 60 -90 persons per hectare.

## 12.3 PLANNING DISTRICTS WISE PROPOSED LAND USE

Section 3.3 of Chapter 3 outlines the boundaries. **All units in this section are in hectares and enlarged maps in Annexure-II.**

### 12.3.1 PLANNING DISTRICT NO.1 – POLICE BAZAR

**Area:** 12.30 Hectares

**Location:** Within the core area

**Major Landmarks:** Jama Masjid, Ramakrishna Mission School, SADAR Police Station, Payal Cinema (Figure 12-3).

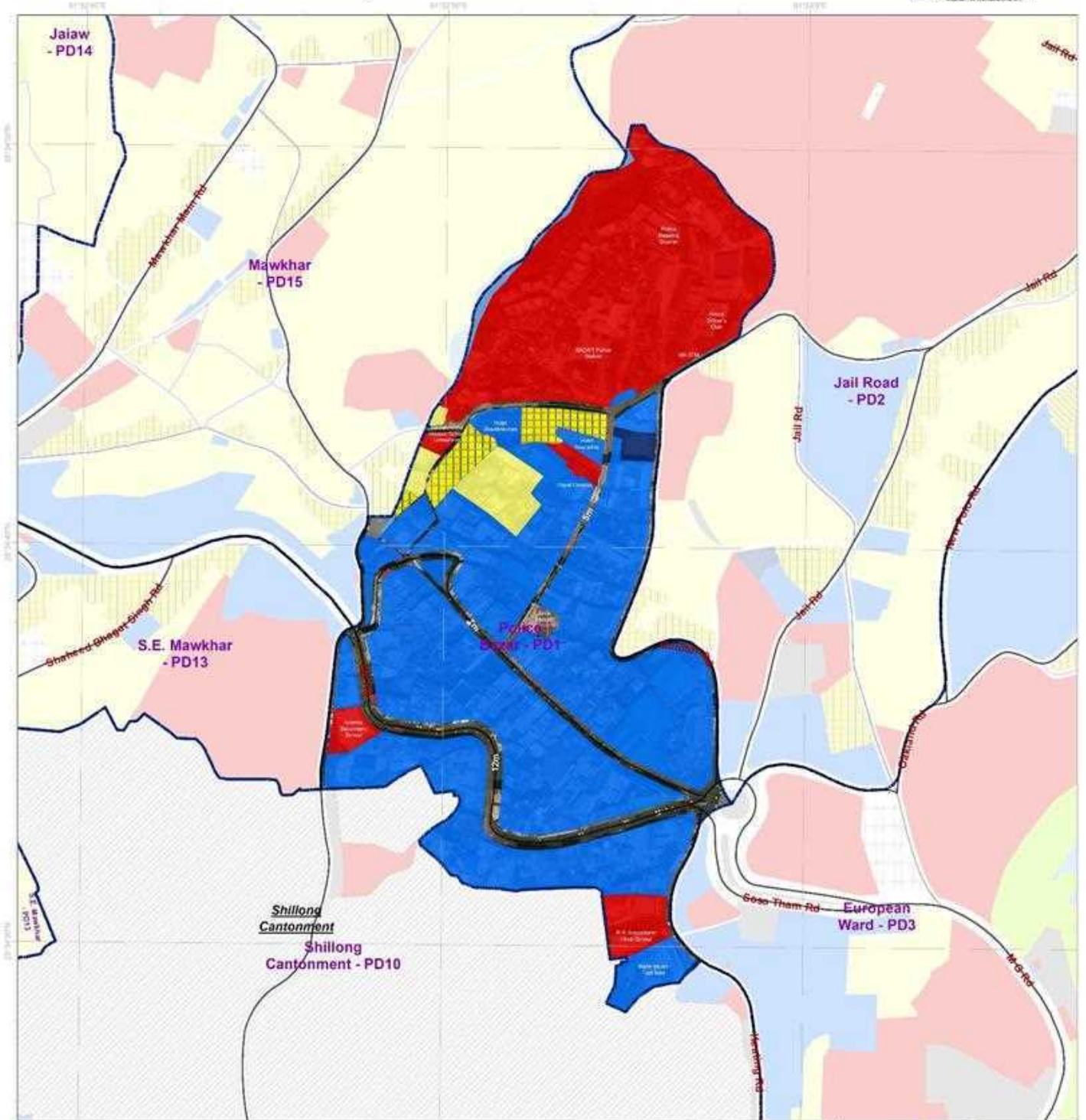
Table 12-3: Proposed Landuse-PD01 - Police Bazar

SNo	Categories	Area(Ha)	%age
1	Residential	0.33	2.67
2	Commercial	6.63	53.92
3	Mixed	0.30	2.42
4	Industrial	0.00	0.00
5	Public & Semi-public	3.63	29.48
6	Public Utilities	0.00	0.00
7	Transportation	1.32	10.76
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.03
10	Recreational/ Green Buffer/ NDZ	0.00	0.00
11	Agriculture & Allied Activities	0.00	0.00
12	Water Sheet	0.09	0.74
13	Forest Area	0.00	0.00
14	Hazards Prone Area	0.00	0.00
<b>Grand Total</b>		<b>12.30</b>	<b>100</b>

#### General Description about the Proposed Land Use in planning district:

The planning district being the core business area for Shillong city is predominantly having commercial land use. An additional commercial area of 0.065 Ha is proposed and thus comprising 6.63 ha, occupying 53.92% of the total area (Table 12-3).

**FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
PLANNING DISTRICTS - 01, POLICE BAZAR**



**Legend**

- Baseline Info.**
- National Highway
  - State Highway
  - Other District Road
  - Major District Road
  - Other District Road
  - Bypass
  - Service Road
  - Major City Road
  - Minor City Road
  - Other Public Road
  - Other Private Road
  - Village road

- Administrative Boundary**
- District Boundary
  - Planning Boundary
  - Planning Districts
- Inner Ring Road, 9m, 12m  
Outer Ring Road, 12m  
Peripheral Ring Road, 18m

- Proposed Roads and Land Use:**
- |                             |               |
|-----------------------------|---------------|
| Existing Road to be Widened | Proposed Road |
| 9m                          | 9m            |
| 12m                         | 12m           |
| 15m                         | 15m           |
| 18m                         | 18m           |
| 24m                         | 24m           |

- Agriculture & Allied Activities
- Water Sheet
- Forest Area
- Hazards Prone Area

EXI	PRO	CATEGORIES
[Yellow]	[Blue]	Residential
[Blue]	[Red]	Commercial
[Yellow]	[Purple]	Mixed
[Purple]	[Red]	Industrial
[Red]	[Red]	Public & Semi-public
[Brown]	[Brown]	Public Utilities
[Grey]	[Grey]	Transportation
[Light Green]	[Light Green]	Township
[Hatched]	[Hatched]	Defense Area / Military Zone
[Light Green]	[Light Green]	Recreational/ Green Buffer/ NDZ



Scale - 1:2,000

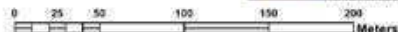


Figure 12-3: Proposed Land Use - PD01 - Police Bazar



### 12.3.2 PLANNING DISTRICT NO.2 – JAIL ROAD

**Area:** 99.76 Hectares

**Location:** Within the core area

**Major Landmarks:** Central Medical Store, District Jail, Marriott Hotel, Vishal Mega Mart, Meghalaya Tourist Information Centre, FCI FSD, Meghalaya Transport Corporation, Ganesh Das Hospital, Polo Towers, NIFT, Ramakrishna Mission Vivekananda Cultural Centre, MIMHANS, District Commerce & Industries Centre (*Figure 12-4*).

Table 12-4: Proposed Landuse-PD02 - Jail Road

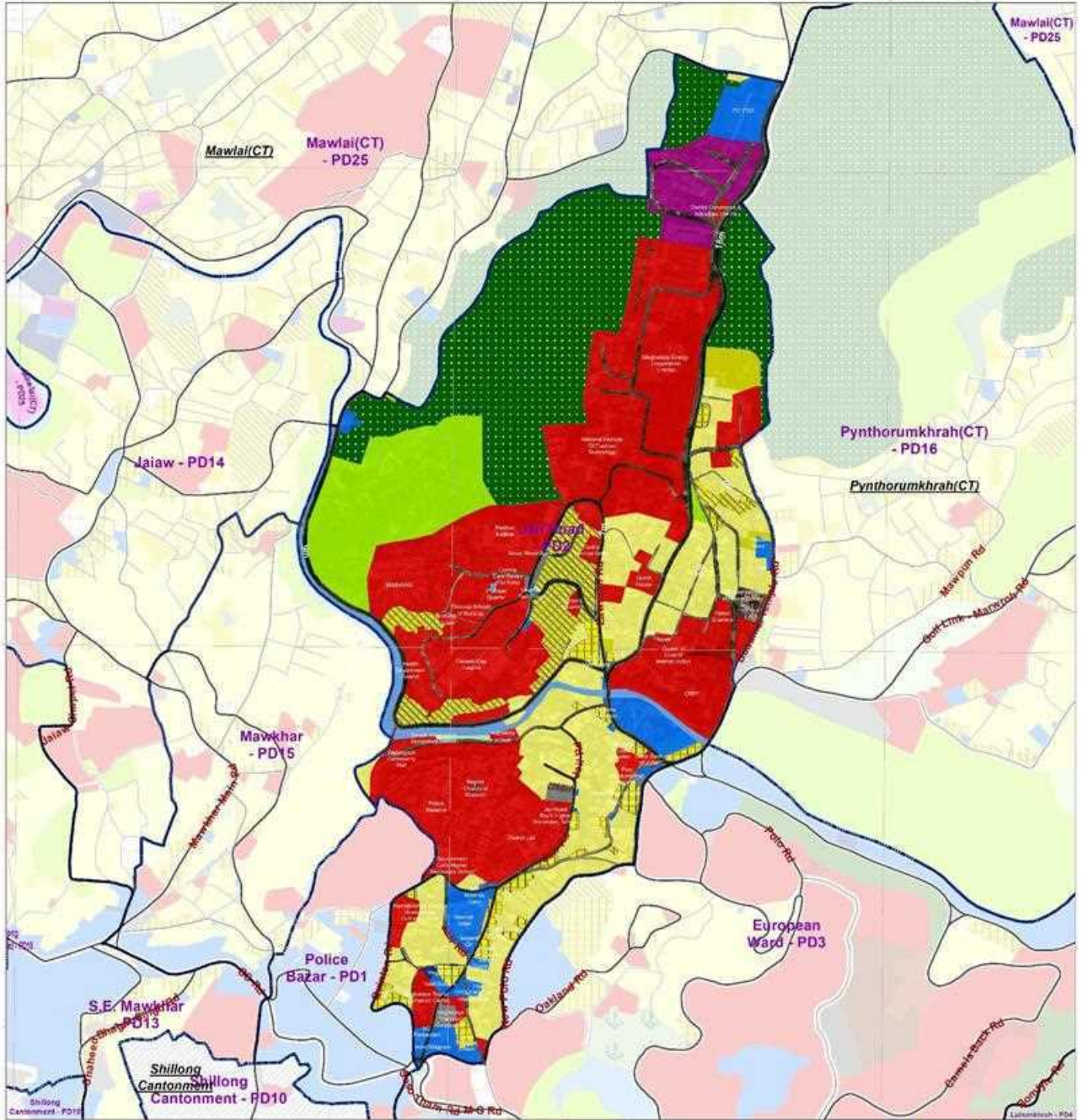
SNo	Categories	Area(Ha)	%age
1	Residential	15.99	16.02
2	Commercial	4.24	4.25
3	Mixed	5.58	5.59
4	Industrial	2.65	2.66
5	Public & Semi-public	34.09	34.16
6	Public Utilities	0.02	0.02
7	Transportation	8.82	8.84
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	7.52	7.53
11	Agriculture & Allied Activities	0.00	0.00
12	Water Sheet	1.66	1.67
13	Forest Area	19.23	19.27
14	Hazards Prone Area	0.00	0.00
<b>Grand Total</b>		<b>99.76</b>	<b>100</b>

#### General Description about the Proposed Land Use in planning district:

The prominent land use within this district is public and semi-public, followed by forest area and residential area. An additional 0.16 Ha is proposed for Public & Semi-public and 0.95 Ha for residential area, which sum up to 34.09 Ha and 15.99 Ha respectively, representing 34.16% of Public & Semi-public and 16.02% of Residential of the total area (*Table 11-4*).

Other land uses proposed within the planning district include recreational/green buffer/NDZ, commercial, and mixed use, each with an additional area of 0.08 Ha, 0.047 Ha, and 0.33 Ha, respectively, thus comprising 7.53 Ha (Recreational/green buffer/NDZ), 4.25 Ha (commercial ) and 5.58 Ha (mixed use) of the total area.

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
PLANNING DISTRICTS - 02, JAIL ROAD



**Legend**

- Baseline Info:**
- National Highway
  - State Highway
  - Major District Road
  - Other District Road
  - Bypass
  - Service Road
  - Major City Road
  - Minor City Road
  - Other Public Road
  - Other Private Road
  - Village road
- Administrative Boundary**
- District Boundary
- Planning Boundary**
- Planning Districts:
  - Inner Ring Road, 9m, 12m
  - Outer Ring Road, 12m
  - Peripheral Ring Road, 18m

- Proposed Roads and Land Use:**
- | Existing Road to be Widened | Proposed Road |
|-----------------------------|---------------|
| 9m                          | 9m            |
| 12m                         | 12m           |
| 15m                         | 15m           |
| 18m                         | 18m           |
| 24m                         | 24m           |

- Agriculture & Allied Activities
- Water Sheet
- Forest Area
- Hazards Prone Area

EXI	PRO	CATEGORIES
[Yellow]	[Yellow]	Residential
[Blue]	[Blue]	Commercial
[Green]	[Green]	Mixed
[Red]	[Red]	Industrial
[Purple]	[Purple]	Public & Semi-public
[Brown]	[Brown]	Public Utilities
[Grey]	[Grey]	Transportation
[Light Green]	[Light Green]	Township
[Hatched]	[Hatched]	Defense Area / Military Zone
[Light Blue]	[Light Blue]	Recreational/ Green Buffer/ NDZ

**KEY MAP**



Scale - 1:5,000



Figure 12-4: Proposed Land Use - PD02 - Jail Road



### 12.3.3 PLANNING DISTRICT NO.3 – EUROPEAN WARD

**Area:** 148.97 Hectares

**Location:** Within the core area

**Major Landmarks:** All Saint's Cathedral, IGP Point, NECTAR, Passport Seva Kendra, CMJ University, General Post Office, Meghalaya High Court, Meghalaya Public Service Commission, Civil Hospital Shillong, Raj Bhavan, Shillong Club, State Central Library, Ward's Lake (Figure 11-5).

Table 12-5: Proposed Landuse-PD03 - European Ward

SNo	Categories	Area(Ha)	%age
1	Residential	14.46	9.72
2	Commercial	9.22	6.20
3	Mixed	5.15	3.46
4	Industrial	0.00	0.00
5	Public & Semi public	79.81	53.61
6	Public Utilities	3.20	2.15
7	Transportation	16.70	11.22
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	13.53	9.09
11	Agriculture & Allied Activities	3.60	2.42
12	Water Sheet	3.18	2.14
13	Forest Area	0.00	0.00
14	Hazards Prone Area	0.00	0.00
<b>Grand Total</b>		<b>148.97</b>	<b>100</b>

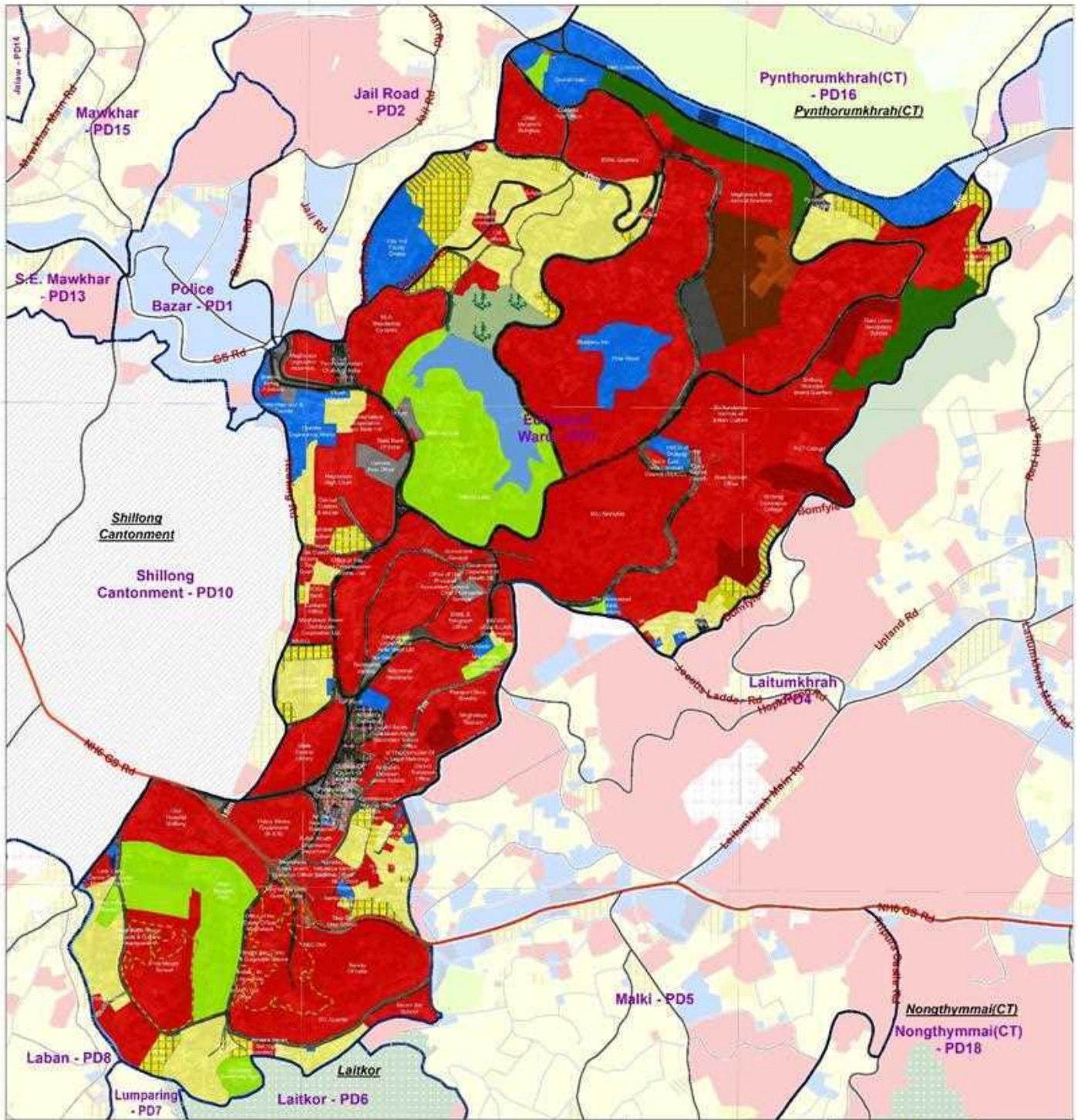
#### General Description about the Proposed Land Use in planning district:

The most prominent land use is public and semi-public, followed by transportation and residential area. An additional 0.45 Ha is proposed for Public & Semi-public, 0.73 Ha for Transportation and 0.17 Ha for residential area, which sum up to 79.81 Ha, 16.70 Ha and 14.46 Ha respectively, representing 53.61% of Public & Semi-public, 11.22% of transportation and 9.72% of Residential of the total area (Table 12-5).

Other significant land use categories being proposed within this district include recreational/green buffer/NDZ, commercial, mixed use and Public Utilities, each with an additional area of 0.02 Ha, 0.12 Ha, 0.22 Ha and 0.38 Ha respectively, and thus comprising 13.53 Ha (Recreational/green buffer/NDZ), 9.22 Ha (Commercial), 5.15 Ha (Mixed use) and 3.20 Ha (Public Utilities) of the total area.



FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 03, EUROPEAN WARD**



**Legend**

<p><b>Baseline Info:</b></p> <ul style="list-style-type: none"> <li>National Highway</li> <li>State Highway</li> <li>Major District Road</li> <li>Other District Road</li> <li>Bypass</li> <li>Service Road</li> <li>Major City Road</li> <li>Minor City Road</li> <li>Other Public Road</li> <li>Other Private Road</li> <li>Village road</li> </ul>	<p><b>Administrative Boundary</b></p> <ul style="list-style-type: none"> <li>District Boundary</li> </ul> <p><b>Planning Boundary</b></p> <ul style="list-style-type: none"> <li>Planning Districts:</li> <li>Inner Ring Road, 9m, 12m</li> <li>Outer Ring Road, 12m</li> <li>Peripheral Ring Road, 18m</li> </ul>	<p><b>Proposed Roads and Land Use:</b></p> <table border="0"> <tr> <td><b>Existing Road to be Widened</b></td> <td><b>Proposed Road</b></td> </tr> <tr> <td>9m</td> <td>9m</td> </tr> <tr> <td>12m</td> <td>12m</td> </tr> <tr> <td>15m</td> <td>15m</td> </tr> <tr> <td>18m</td> <td>18m</td> </tr> <tr> <td>24m</td> <td>24m</td> </tr> </table> <ul style="list-style-type: none"> <li>Agriculture &amp; Allied Activities</li> <li>Water Sheet</li> <li>Forest Area</li> <li>Hazards Prone Area</li> </ul>	<b>Existing Road to be Widened</b>	<b>Proposed Road</b>	9m	9m	12m	12m	15m	15m	18m	18m	24m	24m	<table border="0"> <tr> <th>EXI</th> <th>PRO</th> <th>CATEGORIES</th> </tr> <tr> <td>[Yellow]</td> <td>[Yellow]</td> <td>Residential</td> </tr> <tr> <td>[Blue]</td> <td>[Blue]</td> <td>Commercial</td> </tr> <tr> <td>[Green]</td> <td>[Green]</td> <td>Mixed</td> </tr> <tr> <td>[Red]</td> <td>[Red]</td> <td>Industrial</td> </tr> <tr> <td>[Purple]</td> <td>[Purple]</td> <td>Public &amp; Semi-public</td> </tr> <tr> <td>[Brown]</td> <td>[Brown]</td> <td>Public Utilities</td> </tr> <tr> <td>[Grey]</td> <td>[Grey]</td> <td>Transportation</td> </tr> <tr> <td>[Light Green]</td> <td>[Light Green]</td> <td>Township</td> </tr> <tr> <td>[Dark Green]</td> <td>[Dark Green]</td> <td>Defense Area / Military Zone</td> </tr> <tr> <td>[Light Blue]</td> <td>[Light Blue]</td> <td>Recreational/ Green Buffer/ NDZ</td> </tr> </table>	EXI	PRO	CATEGORIES	[Yellow]	[Yellow]	Residential	[Blue]	[Blue]	Commercial	[Green]	[Green]	Mixed	[Red]	[Red]	Industrial	[Purple]	[Purple]	Public & Semi-public	[Brown]	[Brown]	Public Utilities	[Grey]	[Grey]	Transportation	[Light Green]	[Light Green]	Township	[Dark Green]	[Dark Green]	Defense Area / Military Zone	[Light Blue]	[Light Blue]	Recreational/ Green Buffer/ NDZ	<p><b>KEY MAP</b></p>
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**Scale - 1:5,000**

0 50 100 200 300 400 500 Meters

Figure 12-5: Proposed Land Use - PD03 - European Ward



### 12.3.4 PLANNING DISTRICT NO.4 – LAITUMKHRAH

**Area:** 189.41 Hectares

**Location:** Within the core area

**Major Landmarks:** All India Radio, Cathedral Church, Nazareth Hospital, Guru Singh Sabha Gurudwara, National Institute of Technology, St Edmund's, Fire Bridge Junction, DonBosco Square and St. Anthony's College (*Figure 12-6*).

Table 12-6: Proposed Landuse-PD04-Laitumkhras

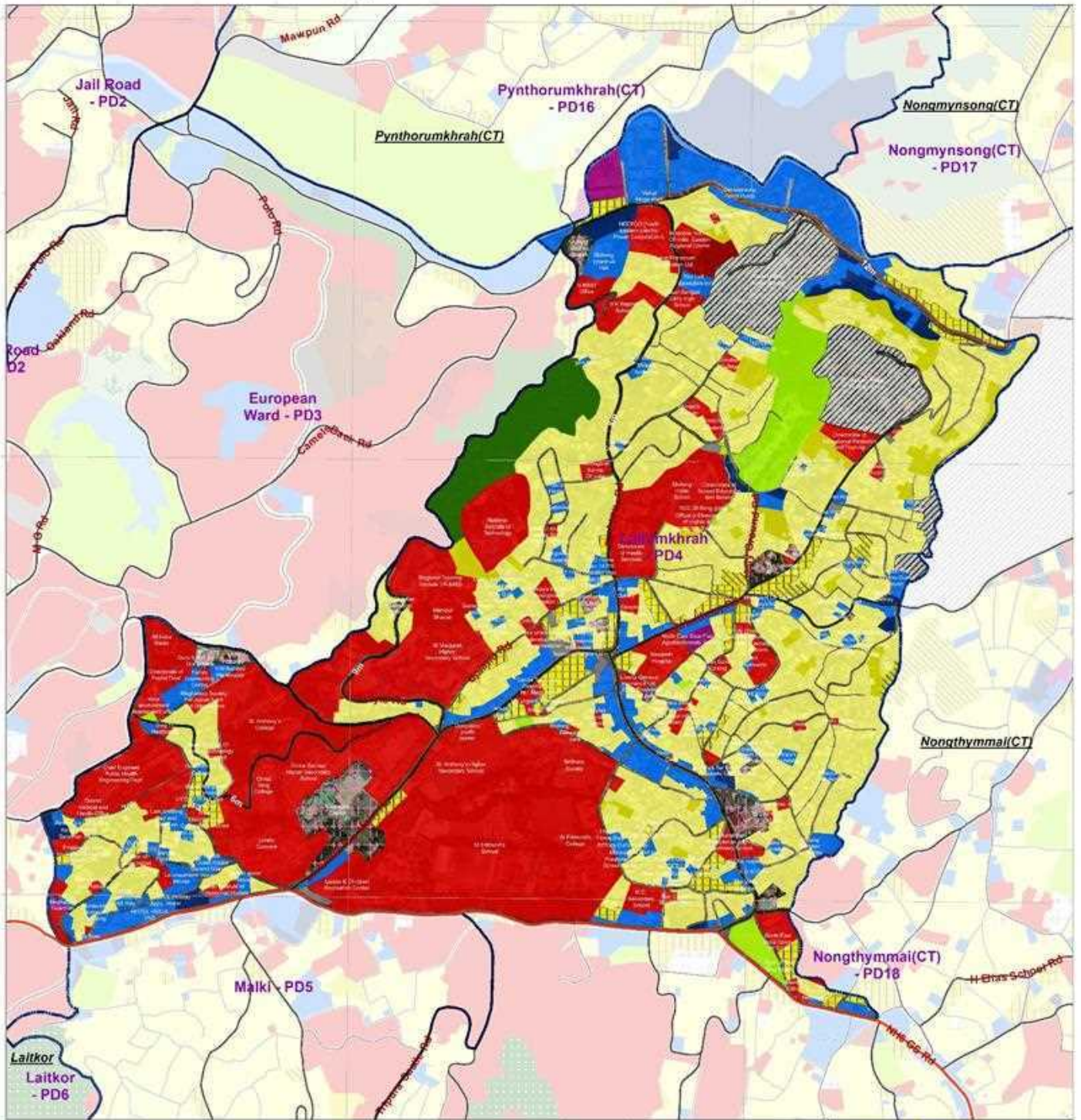
SNo	Categories	Area(Ha)	%age
1	Residential	67.06	35.41
2	Commercial	19.42	10.25
3	Mixed	6.24	3.30
4	Industrial	0.90	0.47
5	Public & Semi public	61.06	32.23
6	Public Utilities	0.00	0.00
7	Transportation	16.96	8.95
8	Township	0.00	0.00
9	Defense Area / Military Zone	8.24	4.35
10	Recreational/ Green Buffer/ NDZ	4.73	2.50
11	Agriculture & Allied Activities	4.05	2.14
12	Water Sheet	0.76	0.40
13	Forest Area	0.00	0.00
14	Hazards Prone Area	0.00	0.00
<b>Grand Total</b>		<b>189.41</b>	<b>100</b>

#### General Description about the Proposed Land Use in planning district:

The dominant land use category in the area is Residential, followed by Public & Semi-public and Commercial. An additional 4.38 Ha is proposed for residential, 0.61 Ha for Public & Semi-public and 2.20 Ha for Commercial, which sum up to 67.06 Ha, 61.06 Ha and 19.42 Ha respectively, representing 35.41% of Residential, 32.23% of Public & Semi-public and 10.25% of Commercial of the total area (*Table 12-6*).

Other land uses proposed within the planning district include mixed use, with an additional area of 0.55 Ha thus comprising 6.24 Ha, occupying 3.3% of the total area.

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 04 - LAITUMKHAH**



**Legend**

<p><b>Baseline Info:</b></p> <ul style="list-style-type: none"> <li><span style="color: red;">—</span> National Highway</li> <li><span style="color: orange;">—</span> State Highway</li> <li><span style="color: yellow;">—</span> Major District Road</li> <li><span style="color: lightblue;">—</span> Other District Road</li> <li><span style="color: grey;">—</span> Bypass</li> <li><span style="color: brown;">—</span> Service Road</li> <li><span style="color: darkblue;">—</span> Major City Road</li> <li><span style="color: purple;">—</span> Minor City Road</li> <li><span style="color: pink;">—</span> Other Public Road</li> <li><span style="color: lightgrey;">—</span> Other Private Road</li> <li><span style="color: lightgreen;">—</span> Village road</li> </ul>	<p><b>Administrative Boundary</b></p> <ul style="list-style-type: none"> <li><span style="border: 1px dashed black; display: inline-block; width: 10px; height: 10px;"></span> District Boundary</li> </ul> <p><b>Planning Boundary</b></p> <ul style="list-style-type: none"> <li><span style="border: 1px solid black; 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border: 1px solid black; display: inline-block; width: 10px; height: 10px;"></span> Water Sheet</li> <li><span style="background-color: #3CB371; border: 1px solid black; display: inline-block; width: 10px; height: 10px;"></span> Forest Area</li> <li><span style="background-color: #FFDAB9; border: 1px solid black; display: inline-block; width: 10px; height: 10px;"></span> Hazards Prone Area</li> </ul>	<span style="border-bottom: 1px solid black; width: 10px; display: inline-block;"></span> Existing Road to be Widened	<span style="border-bottom: 1px solid black; width: 10px; display: inline-block;"></span> 9m	<span style="border-bottom: 1px solid black; width: 10px; display: inline-block;"></span> 12m	<span style="border-bottom: 1px solid black; width: 10px; display: inline-block;"></span> 15m	<span style="border-bottom: 1px solid black; width: 10px; display: inline-block;"></span> 18m	<span style="border-bottom: 1px solid black; width: 10px; display: inline-block;"></span> 24m	<span style="border-bottom: 1px solid black; 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border: 1px solid black; display: inline-block; width: 10px; height: 10px;"></span>	Recreational/ Green Buffer/ NDZ	<p><b>KEY MAP</b></p>
<span style="border-bottom: 1px solid black; width: 10px; display: inline-block;"></span> Existing Road to be Widened	<span style="border-bottom: 1px solid black; width: 10px; display: inline-block;"></span> 9m	<span style="border-bottom: 1px solid black; width: 10px; display: inline-block;"></span> 12m	<span style="border-bottom: 1px solid black; width: 10px; display: inline-block;"></span> 15m	<span style="border-bottom: 1px solid black; width: 10px; display: inline-block;"></span> 18m	<span style="border-bottom: 1px solid black; width: 10px; display: inline-block;"></span> 24m																																												
<span style="border-bottom: 1px solid black; width: 10px; display: inline-block;"></span> Proposed Road	<span style="border-bottom: 1px solid black; width: 10px; display: inline-block;"></span> 9m	<span style="border-bottom: 1px solid black; width: 10px; display: inline-block;"></span> 12m	<span style="border-bottom: 1px solid black; width: 10px; display: inline-block;"></span> 15m	<span style="border-bottom: 1px solid black; width: 10px; display: inline-block;"></span> 18m	<span style="border-bottom: 1px solid black; width: 10px; display: inline-block;"></span> 24m																																												
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**Scale - 1:5,500**

0 50 100 200 300 400 500 Meters

Figure 12-6: Proposed Land Use – PD04 - Laitumkrah



### 12.3.5 PLANNING DISTRICT NO.5 – MALKI

**Area:** 73.72 Hectares

**Location:** Within the core area

**Major Landmarks:** Woodland Hospital, Shillong Law College, Mizoram and Arunachal Circuit houses, Directorate of Horticulture (*Figure 12-7*).

Table12-7: Proposed Landuse-PD05-Malki

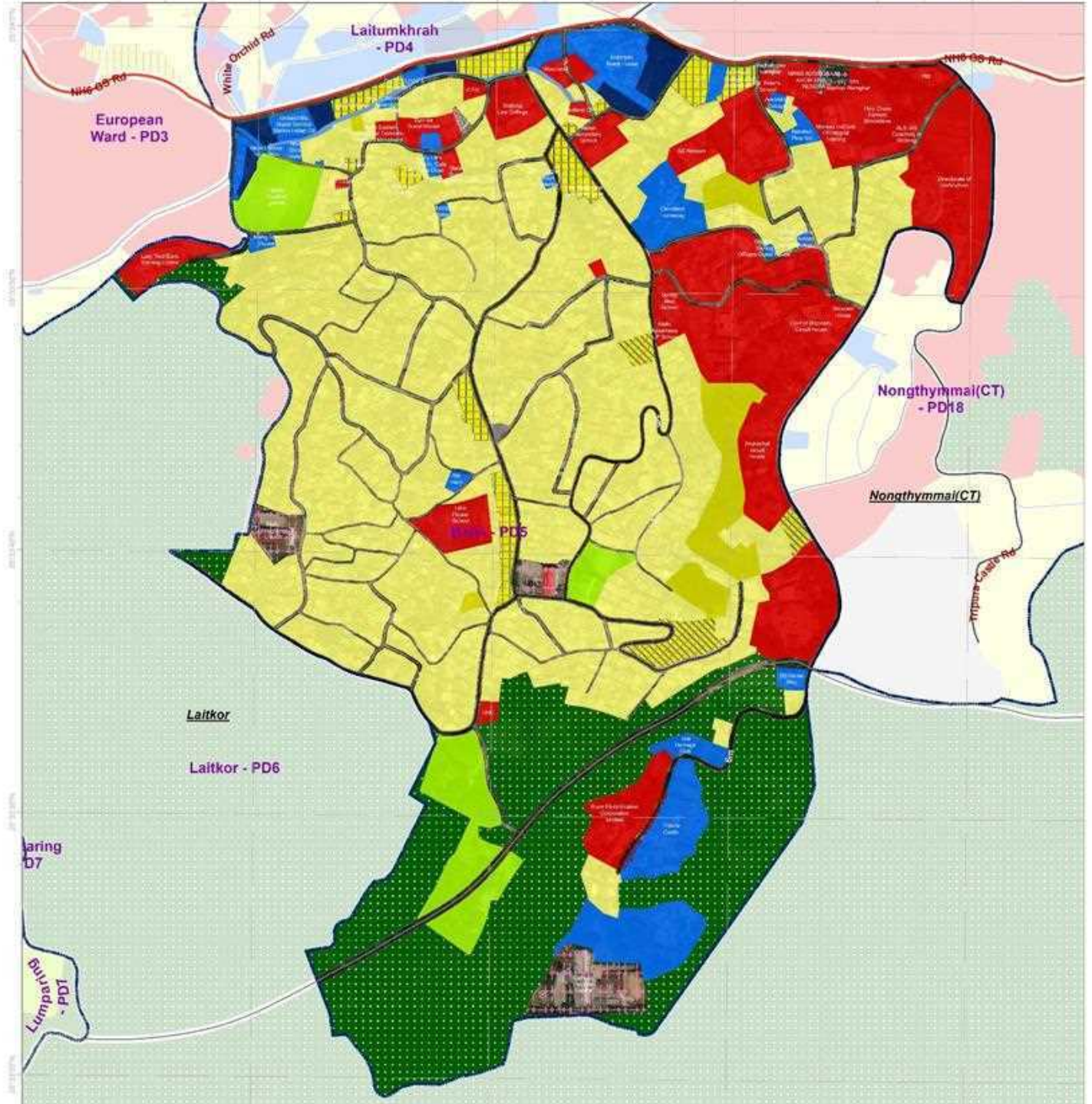
SNo	Categories	Area(Ha)	%age
1	Residential	31.68	43.29
2	Commercial	4.71	6.43
3	Mixed	2.02	2.75
4	Industrial	0.00	0.00
5	Public & Semi public	13.06	17.84
6	Public Utilities	0.00	0.00
7	Transportation	6.49	8.87
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	2.46	3.36
11	Agriculture & Allied Activities	0.00	0.00
12	Water Sheet	0.19	0.26
13	Forest Area	12.59	17.20
14	Hazards Prone Area	0.00	0.00
<b>Grand Total</b>		<b>73.72</b>	<b>100</b>

#### General Description about the Proposed Land Use in planning district:

The most prominent land use is Residential, followed by Public & Semi-public and Forest area. An additional Residential area of 1.46 Ha is proposed and thus comprising 31.68 Ha, occupying 43.29% of the total area (*Table 12-7*).

Other significant land use categories being proposed within this district include a Commercial area, with an additional area of 0.60 Ha, thus comprising 4.71 Ha, occupying 6.43% of the total area.

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 05 - MALKI**



**Legend**

**Baseline Info:**  
 National Highway  
 State Highway  
 Major District Road  
 Other District Road  
 Bypass  
 Service Road  
 Major City Road  
 Minor City Road  
 Other Public Road  
 Other Private Road  
 Village road

**Administrative Boundary**  
 District Boundary  
 Planning Districts:  
 Inner Ring Road, 9m, 12m  
 Outer Ring Road, 12m  
 Peripheral Ring Road, 18m

**Proposed Roads and Land Use:**

Existing Road to be Widened	Proposed Road
9m	9m
12m	12m
15m	15m
18m	18m
24m	24m

**Proposed Roads and Land Use:**  
 Agriculture & Allied Activities  
 Water Sheet  
 Forest Area  
 Hazards Prone Area

EXI	PRO	CATEGORIES
Yellow	Yellow	Residential
Blue	Blue	Commercial
Orange	Orange	Mixed
Red	Red	Industrial
Purple	Purple	Public & Semi-public
Brown	Brown	Public Utilities
Grey	Grey	Transportation
Light Green	Light Green	Township
Hatched	Hatched	Defense Area / Military Zone
Light Green with dots	Light Green with dots	Recreational / Green Buffer / NDZ

**Scale - 1:3,000**  
 0 50 100 200 300 Meters

**KEY MAP**

Figure 12-7: Proposed Land Use - PD05 - Malki



### 12.3.6 PLANNING DISTRICT NO.6 – LAITKOR

**Area:** 711.88 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** Air Force, Laitkor Presbyterian School, St. Joseph Sec. School Laitkor, Reserved Forest Area (Figure 12-8).

Table 12-8: Proposed Landuse-PD06-Laitkor

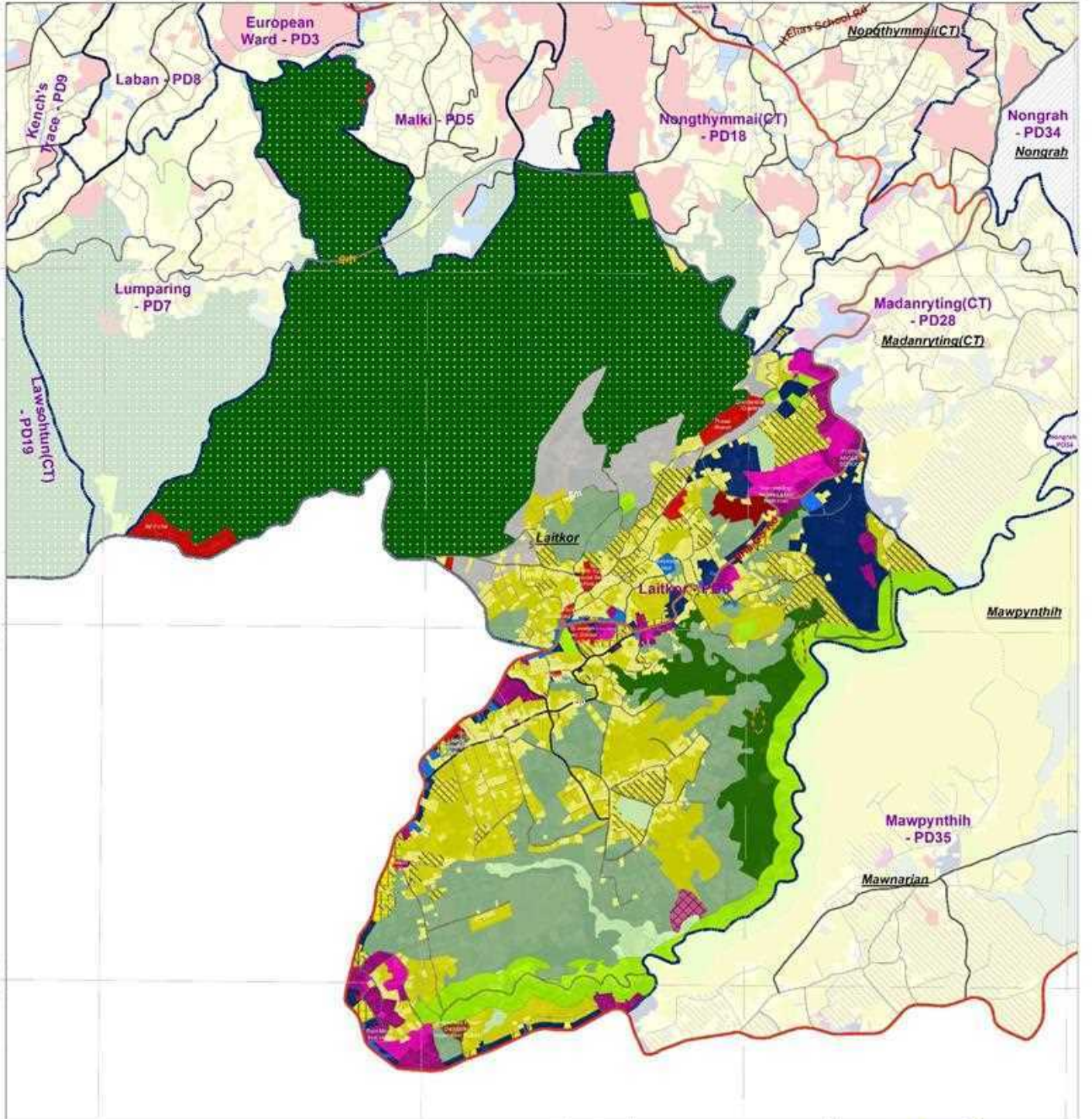
SNo	Categories	Area(Ha)	%age
1	Residential	116.33	16.34
2	Commercial	27.47	3.86
3	Mixed	29.05	4.08
4	Industrial	24.23	3.40
5	Public & Semi public	11.82	1.66
6	Public Utilities	0.62	0.09
7	Transportation	25.34	3.56
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	70.72	9.93
11	Agriculture & Allied Activities	129.87	18.24
12	Water Sheet	1.68	0.24
13	Forest Area	274.71	38.59
14	Hazards Prone Area	0.00	0.00
<b>Grand Total</b>		<b>711.88</b>	<b>100</b>

#### General Description about the Proposed Land Use in planning district:

Forest Area is the most dominant land use in this district, which covers 38.59 of the area. The second most dominant land-use category is Agriculture & Allied Activities (18.24%) followed by residential area (16.34%). An additional 39.35 Ha is proposed for residential area, which account to 116.33 Ha, occupying 16.34% of the total area.

Other significant land use categories being proposed within this district include Recreational/green buffer/NDZ, Commercial, Mixed use, Public Utilities and Industrial each with an additional area of 7.84 Ha, 7.28 Ha, 5.68 HA, 0.15 Ha and 9.13 Ha respectively, thus comprising 70.72 Ha (Recreational/green buffer/NDZ), 27.47 Ha (Commercial), 29.05 Ha (Mixed use), 0.62 Ha (Public Utilities) and 24.23 Ha (Industrial) of the total area (Table 12-8).

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 06 - LAITKOR**



**Legend**

**Baseline Info:**  
 National Highway  
 State Highway  
 Major District Road  
 Other District Road  
 Bypass  
 Service Road  
 Major City Road  
 Minor City Road  
 Other Public Road  
 Other Private Road  
 Village road

**Administrative Boundary**  
 District Boundary  
**Planning Boundary**  
 Planning Districts:  
 Inner Ring Road, 9m, 12m  
 Outer Ring Road, 12m  
 Peripheral Ring Road, 18m

**Proposed Roads and Land Use:**  
**Existing Road to be Widened**  
 9m, 12m, 15m, 18m, 24m  
**Proposed Road**  
 9m, 12m, 15m, 18m, 24m

**EXI PRO CATEGORIES**

Green	Residential
Yellow	Commercial
Blue	Mixed
Purple	Industrial
Red	Public & Semi-public
Brown	Public Utilities
Grey	Transportation
Light Green	Township
Dark Green	Defense Area / Military Zone
Light Blue	Recreational/ Green Buffer/ NDZ

**Other Categories:**  
 Agriculture & Allied Activities  
 Water Sheet  
 Forest Area  
 Hazards Prone Area

**Scale - 1:11,000**  
 0 50 100 200 300 400 500 600 700 800 900 1,000 Meters

**KEY MAP**

Figure 12-8: Proposed Land Use - PD06 - Laitkor



### 12.3.7 PLANNING DISTRICT NO.7 – LUMPARING

**Area:** 156.22 Hectares

**Location:** Within the core area

**Major Landmarks:** Shillong View Point, Tibetan Buddhist Monastery, Raid Laban College  
(Figure 12-9).

Table 12-9: Proposed Landuse-PD07-Lumparing

SNo	Categories	Area(Ha)	%age
1	Residential	50.57	32.37
2	Commercial	0.50	0.32
3	Mixed	1.58	1.01
4	Industrial	0.00	0.00
5	Public & Semi public	3.70	2.37
6	Public Utilities	0.77	0.49
7	Transportation	7.19	4.60
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	8.81	5.64
11	Agriculture & Allied Activities	2.86	1.83
12	Water Sheet	0.03	0.02
13	Forest Area	80.20	51.34
14	Hazards Prone Area	0.00	0.00
<b>Grand Total</b>		<b>156.22</b>	<b>100</b>

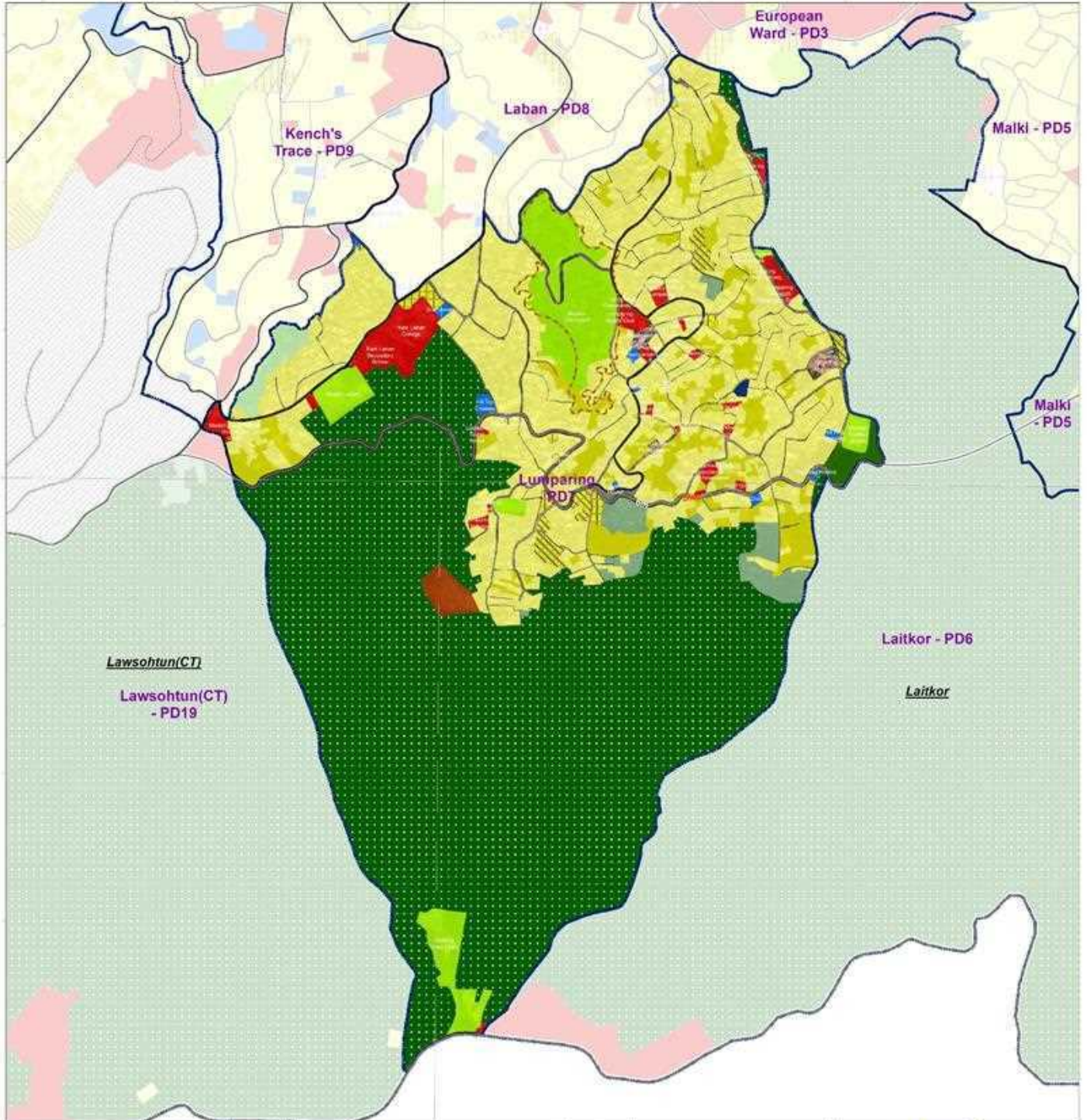
#### General Description about the Proposed Land Use in planning district:

The major categories of land in Lumparing are Forest area (51.34%) and Residential Area/Colony (32.37%). An additional 5.01 Ha is proposed for residential area, which account to 50.57 Ha, occupying 32.37% of the total area (Table 12-9).

Other significant land use categories being proposed within this district include Commercial, and mixed use, each with an additional area of 0.07 Ha and 0.26 Ha respectively, thus comprising 1.58 Ha and 0.5 Ha of the total area of mixed use and Commercial respectively.



FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 07 - LUMPARING**



**Legend**

- Baseline Info:**
- National Highway
  - State Highway
  - Major District Road
  - Other District Road
  - Bypass
  - Service Road
  - Major City Road
  - Minor City Road
  - Other Public Road
  - Other Private Road
  - Village road

- Administrative Boundary**
- District Boundary
- Planning Boundary**
- Planning Districts:
  - Inner Ring Road, 9m, 12m
  - Outer Ring Road, 12m
  - Peripheral Ring Road, 18m

- Proposed Roads and Land Use:**
- | Existing Road to be Widened | Proposed Road |
|-----------------------------|---------------|
| 9m                          | 9m            |
| 12m                         | 12m           |
| 15m                         | 15m           |
| 18m                         | 18m           |
| 24m                         | 24m           |
- Agriculture & Allied Activities
  - Water Sheet
  - Forest Area
  - Hazards Prone Area

EXI	PRO	CATEGORIES
[Yellow]	[Yellow]	Residential
[Blue]	[Blue]	Commercial
[Orange]	[Orange]	Mixed
[Purple]	[Purple]	Industrial
[Red]	[Red]	Public & Semi-public
[Brown]	[Brown]	Public Utilities
[Grey]	[Grey]	Transportation
[Light Green]	[Light Green]	Township
[Hatched]	[Hatched]	Defense Area / Military Zone
[Light Green with Dots]	[Light Green with Dots]	Recreational / Green Buffer / NDZ



Scale - 1:5,500



Figure 12-9: Proposed Land Use - PD07 - Lumparing



### 12.3.8 PLANNING DISTRICT NO.8 – LABAN

**Area:** 35.11 Hectares

**Location:** Within the core area

**Major Landmarks:** Unitarian Church, Laban Namghar Complex, Laban Assamese Girl Higher Secondary School, Madina Masjid (*Figure 12-10*).

Table 12-10: Proposed Landuse-PD08-Laban

SNo	Categories	Area(Ha)	%age
1	Residential	23.52	66.97
2	Commercial	0.92	2.63
3	Mixed	3.63	10.35
4	Industrial	0.00	0.00
5	Public & Semi0public	3.06	8.71
6	Public Utilities	0.00	0.00
7	Transportation	3.54	10.09
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.02	0.05
10	Recreational/ Green Buffer/ NDZ	0.22	0.64
11	Agriculture & Allied Activities	0.00	0.00
12	Water Sheet	0.20	0.56
13	Forest Area	0.00	0.00
14	Hazards Prone Area	0.00	0.00
<b>Grand Total</b>		<b>35.11</b>	<b>100</b>

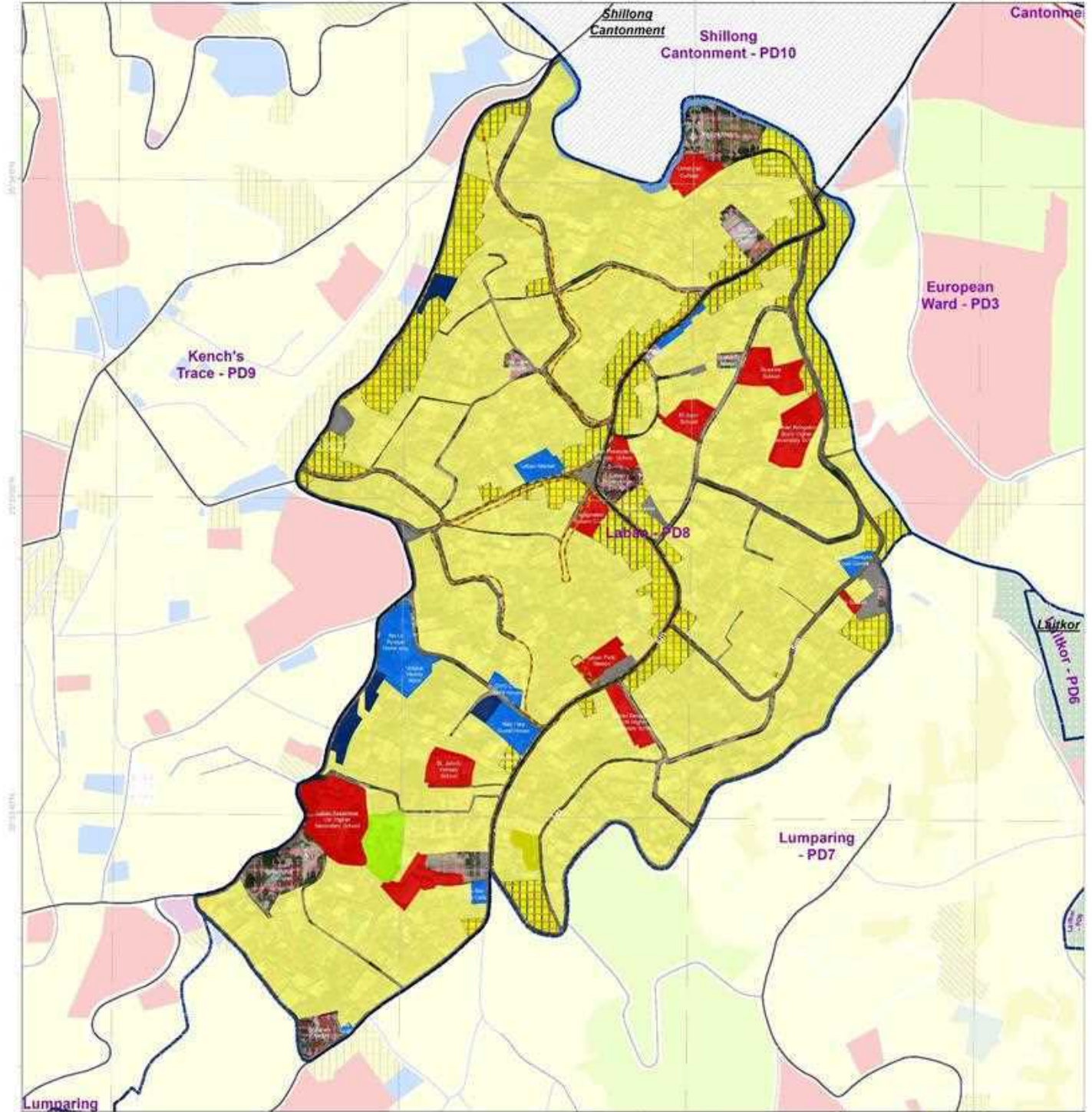
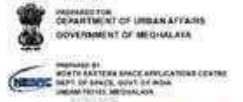
#### General Description about the Proposed Land Use in planning district:

The main land use category in Laban is residential area/colony, which covers 66.97% of the total area. An additional 0.07 Ha is proposed for residential area, which account to 23.52 Ha

The second most dominant land-use category is Mixed use (10.35%) followed by transportation (10.09%) (*Table 12-10*).

Other land use proposed within the planning district includes commercial, with an additional area of 0.22 Ha, which account to 0.92 Ha of the total area.

**FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA**  
**PLANNING DISTRICTS - 08 - LABAN**



**Legend**

<p><b>Baseline Info:</b></p> <ul style="list-style-type: none"> <li>National Highway</li> <li>State Highway</li> <li>Major District Road</li> <li>Other District Road</li> <li>Bypass</li> <li>Service Road</li> <li>Major City Road</li> <li>Minor City Road</li> <li>Other Public Road</li> <li>Other Private Road</li> <li>Village road</li> </ul>	<p><b>Administrative Boundary</b></p> <ul style="list-style-type: none"> <li>District Boundary</li> </ul> <p><b>Planning Boundary</b></p> <ul style="list-style-type: none"> <li>Planning Districts:</li> <li>Inner Ring Road, 9m, 12m</li> <li>Outer Ring Road, 12m</li> <li>Peripheral Ring Road, 18m</li> </ul>	<p><b>Proposed Roads and Land Use:</b></p> <table border="0"> <tr> <td><b>Existing Road to be Widened</b></td> <td><b>Proposed Road</b></td> </tr> <tr> <td>9m</td> <td>9m</td> </tr> <tr> <td>12m</td> <td>12m</td> </tr> <tr> <td>15m</td> <td>15m</td> </tr> <tr> <td>18m</td> <td>18m</td> </tr> <tr> <td>24m</td> <td>24m</td> </tr> </table> <ul style="list-style-type: none"> <li>Agriculture &amp; Allied Activities</li> <li>Water Sheet</li> <li>Forest Area</li> <li>Hazards Prone Area</li> </ul>	<b>Existing Road to be Widened</b>	<b>Proposed Road</b>	9m	9m	12m	12m	15m	15m	18m	18m	24m	24m	<table border="0"> <tr> <td><b>EXI</b></td> <td><b>PRO</b></td> <td><b>CATEGORIES</b></td> </tr> <tr> <td>[Yellow]</td> <td>[Yellow]</td> <td>Residential</td> </tr> <tr> <td>[Blue]</td> <td>[Blue]</td> <td>Commercial</td> </tr> <tr> <td>[Green]</td> <td>[Green]</td> <td>Mixed</td> </tr> <tr> <td>[Red]</td> <td>[Red]</td> <td>Industrial</td> </tr> <tr> <td>[Purple]</td> <td>[Purple]</td> <td>Public &amp; Semi-public</td> </tr> <tr> <td>[Brown]</td> <td>[Brown]</td> <td>Public Utilities</td> </tr> <tr> <td>[Grey]</td> <td>[Grey]</td> <td>Transportation</td> </tr> <tr> <td>[Light Green]</td> <td>[Light Green]</td> <td>Township</td> </tr> <tr> <td>[Hatched]</td> <td>[Hatched]</td> <td>Defense Area / Military Zone</td> </tr> <tr> <td>[Light Blue]</td> <td>[Light Blue]</td> <td>Recreational/ Green Buffer/ NDZ</td> </tr> </table>	<b>EXI</b>	<b>PRO</b>	<b>CATEGORIES</b>	[Yellow]	[Yellow]	Residential	[Blue]	[Blue]	Commercial	[Green]	[Green]	Mixed	[Red]	[Red]	Industrial	[Purple]	[Purple]	Public & Semi-public	[Brown]	[Brown]	Public Utilities	[Grey]	[Grey]	Transportation	[Light Green]	[Light Green]	Township	[Hatched]	[Hatched]	Defense Area / Military Zone	[Light Blue]	[Light Blue]	Recreational/ Green Buffer/ NDZ	<p><b>KEY MAP</b></p>
<b>Existing Road to be Widened</b>	<b>Proposed Road</b>																																																
9m	9m																																																
12m	12m																																																
15m	15m																																																
18m	18m																																																
24m	24m																																																
<b>EXI</b>	<b>PRO</b>	<b>CATEGORIES</b>																																															
[Yellow]	[Yellow]	Residential																																															
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[Brown]	[Brown]	Public Utilities																																															
[Grey]	[Grey]	Transportation																																															
[Light Green]	[Light Green]	Township																																															
[Hatched]	[Hatched]	Defense Area / Military Zone																																															
[Light Blue]	[Light Blue]	Recreational/ Green Buffer/ NDZ																																															

**Scale - 1:2,500**

0 50 100 200 Meters

Figure 12-10: Proposed Land Use - PD08 - Laban



### 12.3.9 PLANNING DISTRICT NO.9 – KENCH’S TRACE

**Area:** 69.49 Hectares

**Location:** Within the core area

**Major Landmarks:** Meghalaya Legislative Assembly, The Shillong Times, Sankardev College, All Saints Church Cemetery (*Figure 12-11*).

**Table 12-11: Proposed Landuse-PD09-Kench’s Trace**

SNo	Categories	Area(Ha)	%age
1	Residential	41.66	59.98
2	Commercial	2.81	4.04
3	Mixed	2.86	4.12
4	Industrial	0.13	0.19
5	Public & Semi public	10.90	15.69
6	Public Utilities	0.06	0.09
7	Transportation	6.72	9.67
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.86	1.23
10	Recreational/ Green Buffer/ NDZ	1.98	2.85
11	Agriculture & Allied Activities	0.15	0.22
12	Water Sheet	1.33	1.91
13	Forest Area	0.00	0.00
14	Hazards Prone Area	0.00	0.00
<b>Grand Total</b>		<b>69.49</b>	<b>100</b>

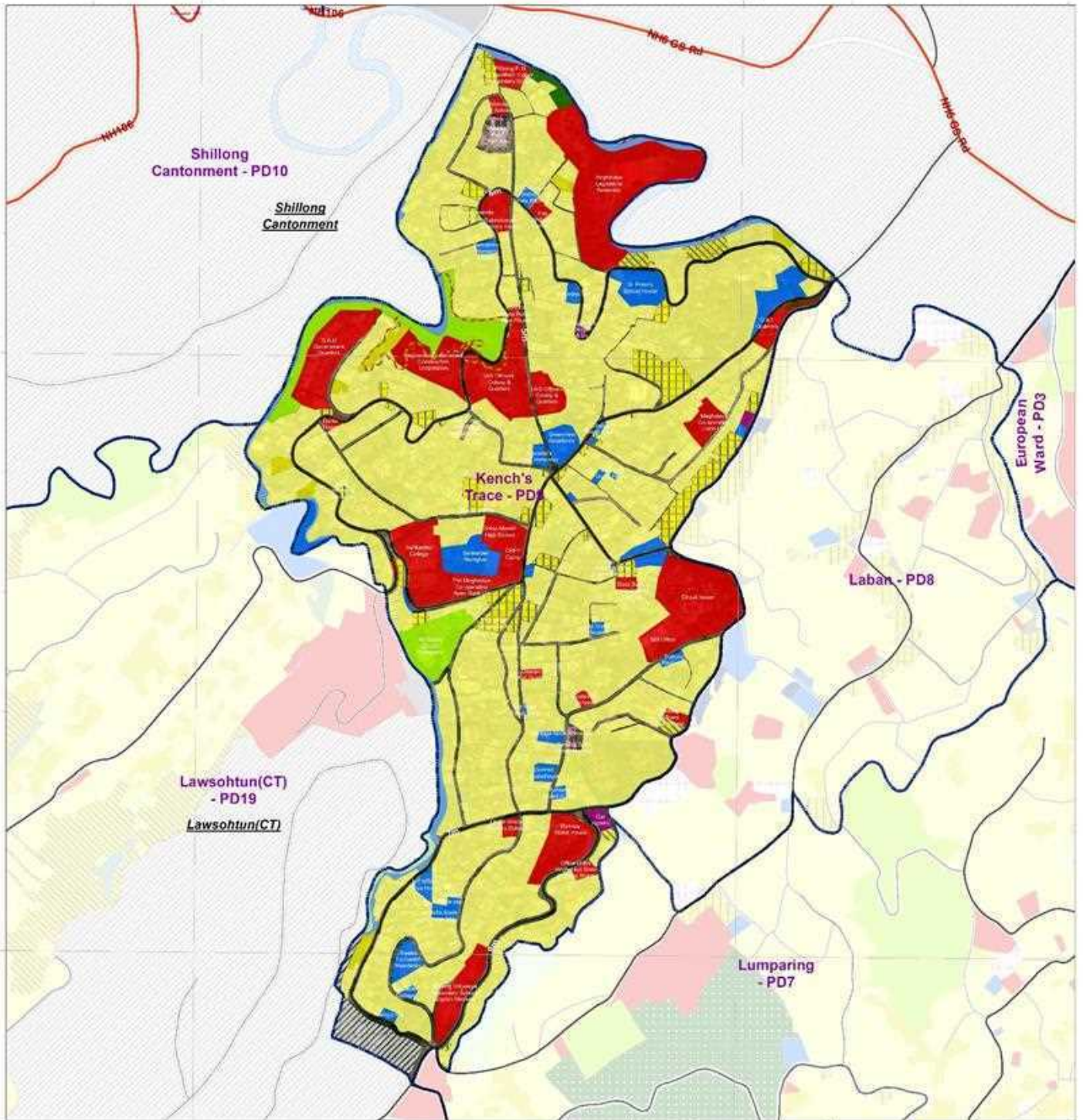
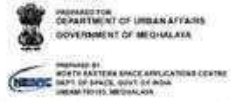
**General Description about the Proposed Land Use in planning district:**

The main land use category in Kench’s Trace is residential area/colony, which covers 59.98% of the total area. An additional 0.56 Ha is proposed for residential area, which account to 41.66 Ha (*Table 12-11*).

The second most dominant land-use category is Public & Semi-public (15.69%) followed by transportation (9.67%).

Other significant land use categories being proposed within this district include recreational/green buffer/NDZ, mixed use and Public Utilities, each with an additional area of 0.14 Ha, 0.09 Ha and 0.05 Ha respectively, thus comprising 1.98 Ha (recreational/green buffer/NDZ), 2.86 Ha (Mixed use) and 0.06 Ha (Public Utilities) of the total area.

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 09 - KENCH'S TRACE**



Legend		Proposed Roads and Land Use		EXI	PRO	CATEGORIES	KEY MAP
<b>Baseline Info:</b>		<b>Existing Road to be Widened</b>		9m		Residential	
National Highway		12m		12m		Commercial	
State Highway		15m		15m		Mixed	
Major District Road		18m		18m		Industrial	
Other District Road		24m		24m		Public & Semi-public	
Bypass		Agriculture & Allied Activities		Public Utilities		Transportation	
Service Road		Water Sheet		Township		Defense Area / Military Zone	
Major City Road		Forest Area		Recreational/ Green Buffer/ NDZ			
Minor City Road		Hazards Prone Area					
Other Public Road							
Other Private Road							
Village road							
<b>Administrative Boundary</b>		<b>Proposed Road</b>		9m			
District Boundary		9m		12m			
Planning Districts:		12m		15m			
Inner Ring Road, 9m, 12m		15m		18m			
Outer Ring Road, 12m		18m		24m			
Peripheral Ring Road, 18m		24m					

Scale - 1:4,000

0 50 100 200 300 Meters

Figure 12-11: Proposed Land Use - PD09 - Kench's Trace



### 12.3.10 PLANNING DISTRICT NO.10 – SHILLONG CANTONMENT

**Area:** 192.77 Hectares

**Location:** Within the core area

**Major Landmarks:** Lord Mahavira Park, NCC Headquarter, Galleria Anjalee Cinema, Anjalee Petrol Pump (*Figure 12-12*).

**Table 12-12: Proposed Landuse-PD10-Shillong Cantonment**

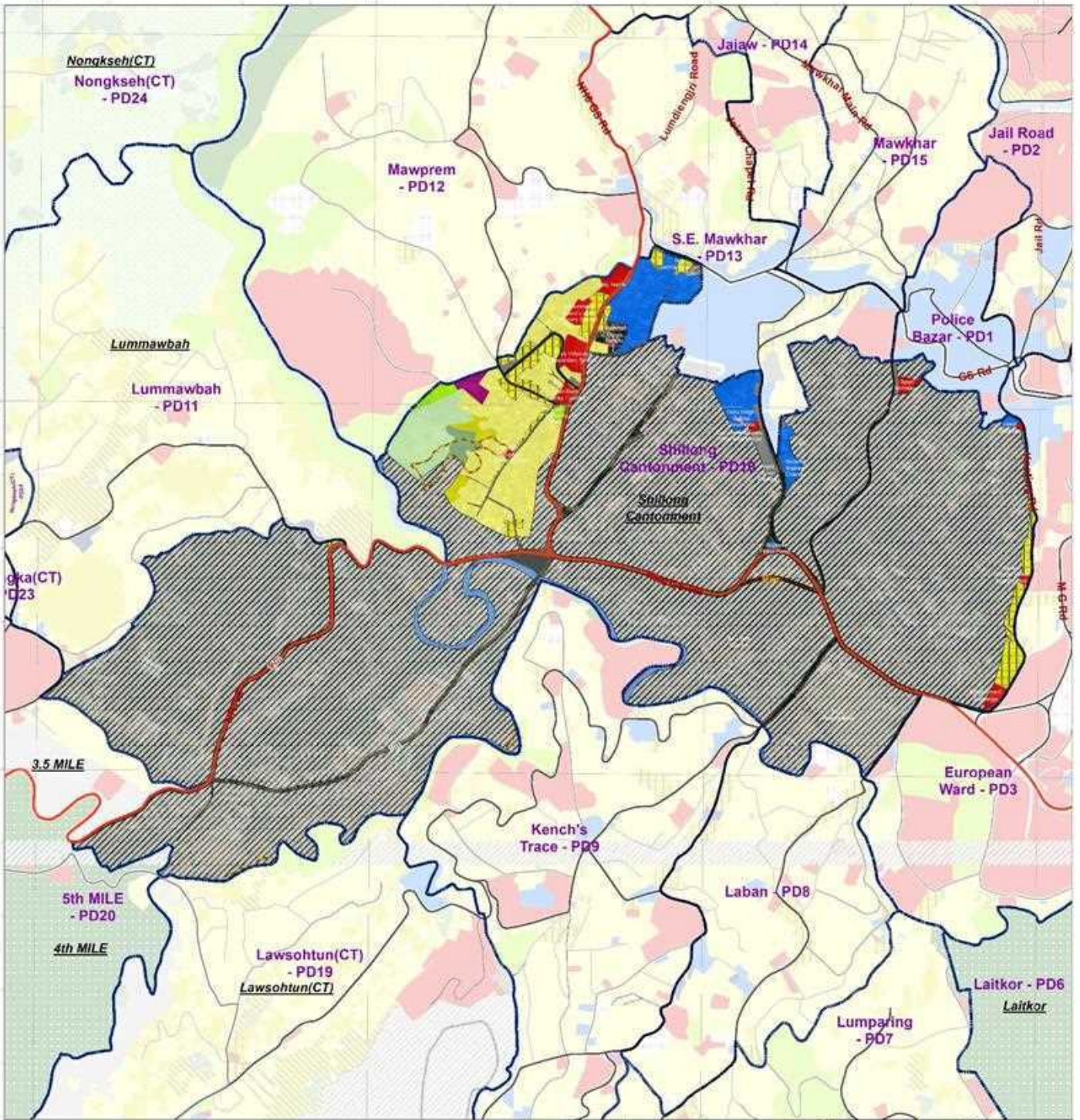
SNo	Categories	Area(Ha)	%age
1	Residential	8.88	4.61
2	Commercial	4.35	2.25
3	Mixed	3.09	1.60
4	Industrial	0.33	0.17
5	Public & Semi0public	2.27	1.18
6	Public Utilities	0.00	0.00
7	Transportation	10.25	5.32
8	Township	0.00	0.00
9	Defense Area / Military Zone	157.94	81.93
10	Recreational/ Green Buffer/ NDZ	2.85	1.48
11	Agriculture & Allied Activities	0.49	0.26
12	Water Sheet	2.32	1.21
13	Forest Area	0.00	0.00
14	Hazards Prone Area	0.00	0.00
<b>Grand Total</b>		<b>192.77</b>	<b>100</b>

#### **General Description about the Proposed Land Use in planning district:**

In Shillong Cantonment area, the majority of the land is classified as "Unclassified" with 81.93%, followed by "Transportation" at 5.32%, "Residential" at 4.61%, and "Commercial" at 2.25%. The other land use categories have a relatively smaller percentage area.

The major land use categories being proposed within this district include Transportation, Residential, Mixed use and Proposed Recreational/ Green Buffer/ NDZ each with an additional area of 0.29 Ha, 0.53 Ha, 0.08 Ha and 2.46 Ha respectively, thus comprising 10.25 Ha (Transportation), 8.88 Ha (Residential), 3.09 Ha (Mixed use) and 2.85 Ha (Proposed Recreational/ Green Buffer/ NDZ) of the total area (*Table 12-12*).

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 10 - SHILLONG CANTONMENT**



**Legend**

<p><b>Baseline Info:</b></p> <ul style="list-style-type: none"> <li>National Highway</li> <li>State Highway</li> <li>Major District Road</li> <li>Other District Road</li> <li>Bypass</li> <li>Service Road</li> <li>Major City Road</li> <li>Minor City Road</li> <li>Other Public Road</li> <li>Other Private Road</li> <li>Village road</li> </ul>	<p><b>Administrative Boundary</b></p> <ul style="list-style-type: none"> <li>District Boundary</li> </ul> <p><b>Planning Boundary</b></p> <ul style="list-style-type: none"> <li>Planning Districts:</li> <li>Inner Ring Road, 9m, 12m</li> <li>Outer Ring Road, 12m</li> <li>Peripheral Ring Road, 18m</li> </ul>	<p><b>Proposed Roads and Land Use:</b></p> <table border="0"> <tr> <td>Existing Road to be Widened</td> <td>Proposed Road</td> </tr> <tr> <td>9m</td> <td>9m</td> </tr> <tr> <td>12m</td> <td>12m</td> </tr> <tr> <td>15m</td> <td>15m</td> </tr> <tr> <td>18m</td> <td>18m</td> </tr> <tr> <td>24m</td> <td>24m</td> </tr> </table> <ul style="list-style-type: none"> <li>Agriculture &amp; Allied Activities</li> <li>Water Sheet</li> <li>Forest Area</li> <li>Hazards Prone Area</li> </ul>	Existing Road to be Widened	Proposed Road	9m	9m	12m	12m	15m	15m	18m	18m	24m	24m	<table border="0"> <tr> <th>EXI</th> <th>PRO</th> <th>CATEGORIES</th> </tr> <tr> <td>[Yellow]</td> <td>[Yellow]</td> <td>Residential</td> </tr> <tr> <td>[Blue]</td> <td>[Blue]</td> <td>Commercial</td> </tr> <tr> <td>[Green]</td> <td>[Green]</td> <td>Mixed</td> </tr> <tr> <td>[Red]</td> <td>[Red]</td> <td>Industrial</td> </tr> <tr> <td>[Purple]</td> <td>[Purple]</td> <td>Public &amp; Semi-public</td> </tr> <tr> <td>[Brown]</td> <td>[Brown]</td> <td>Public Utilities</td> </tr> <tr> <td>[Grey]</td> <td>[Grey]</td> <td>Transportation</td> </tr> <tr> <td>[Diagonal Lines]</td> <td>[Diagonal Lines]</td> <td>Township</td> </tr> <tr> <td>[Hatched]</td> <td>[Hatched]</td> <td>Defense Area / Military Zone</td> </tr> <tr> <td>[Light Green]</td> <td>[Light Green]</td> <td>Recreational/ Green Buffer/ NDZ</td> </tr> </table>	EXI	PRO	CATEGORIES	[Yellow]	[Yellow]	Residential	[Blue]	[Blue]	Commercial	[Green]	[Green]	Mixed	[Red]	[Red]	Industrial	[Purple]	[Purple]	Public & Semi-public	[Brown]	[Brown]	Public Utilities	[Grey]	[Grey]	Transportation	[Diagonal Lines]	[Diagonal Lines]	Township	[Hatched]	[Hatched]	Defense Area / Military Zone	[Light Green]	[Light Green]	Recreational/ Green Buffer/ NDZ	<p><b>KEY MAP</b></p>
Existing Road to be Widened	Proposed Road																																																
9m	9m																																																
12m	12m																																																
15m	15m																																																
18m	18m																																																
24m	24m																																																
EXI	PRO	CATEGORIES																																															
[Yellow]	[Yellow]	Residential																																															
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[Green]	[Green]	Mixed																																															
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[Grey]	[Grey]	Transportation																																															
[Diagonal Lines]	[Diagonal Lines]	Township																																															
[Hatched]	[Hatched]	Defense Area / Military Zone																																															
[Light Green]	[Light Green]	Recreational/ Green Buffer/ NDZ																																															

**Scale - 1:6,500**

0 50 100 200 300 400 500 Meters

Figure 12-12: Proposed Land Use - PD10 - Shillong Cantonment



### 12.3.11 PLANNING DISTRICT NO.11 – LUMMAWBAH

**Area:** 79.3 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** Church of God Lummawbah, Shon Roy Basan high School, Trumpet Church (Figure 12-13).

Table 12-13: Proposed Landuse-PD11-Lummawbah

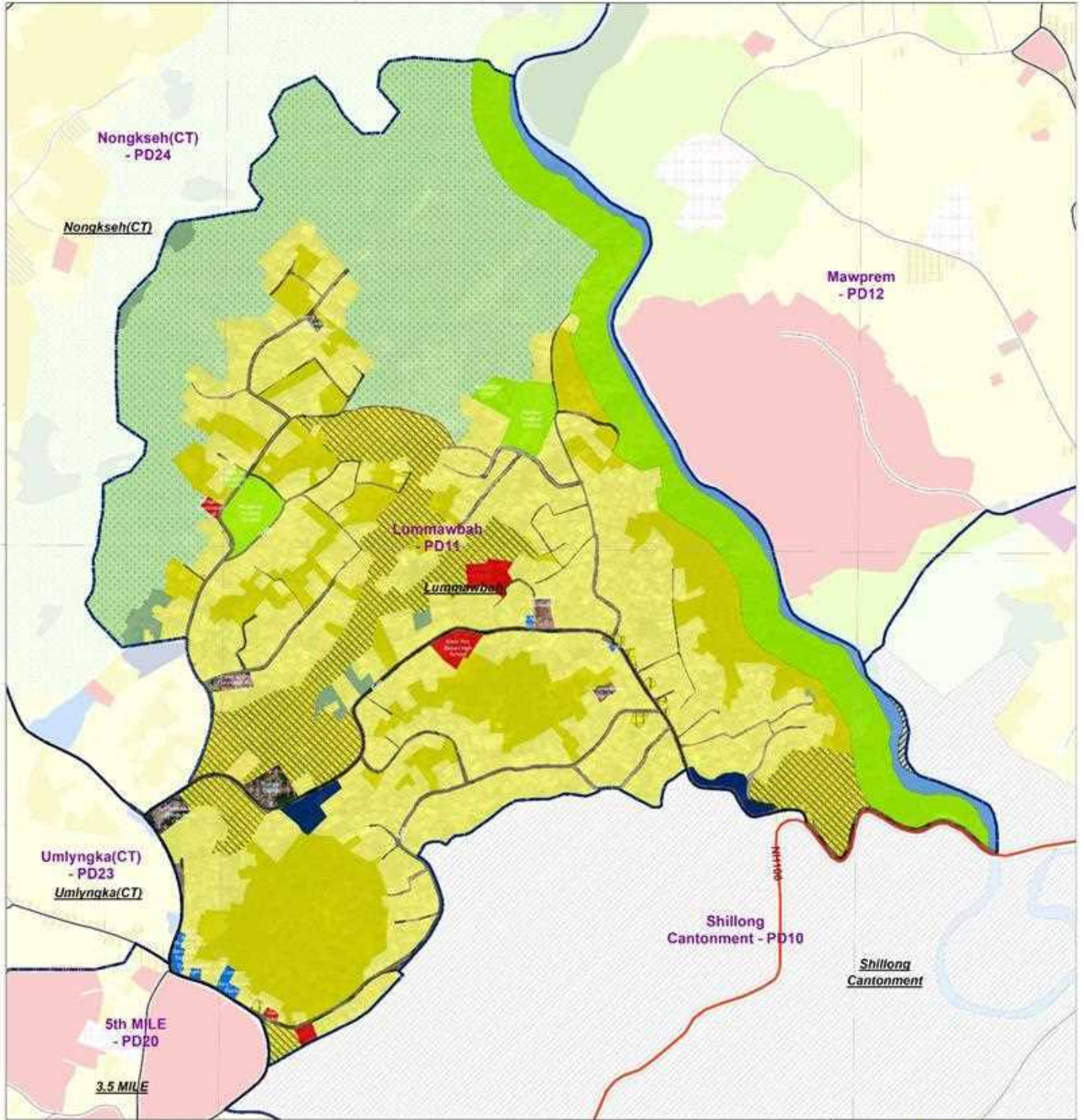
SNo	Categories	Area(Ha)	%age
1	Residential	38.91	49.07
2	Commercial	0.58	0.73
3	Mixed	7.01	8.84
4	Industrial	0.00	0.00
5	Public & Semipublic	1.14	1.44
6	Public Utilities	0.00	0.00
7	Transportation	3.23	4.07
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.09	0.11
10	Recreational/ Green Buffer/ NDZ	7.71	9.72
11	Agriculture & Allied Activities	0.67	0.85
12	Water Sheet	1.52	1.91
13	Forest Area	0.00	0.00
14	Hazards Prone Area	18.44	23.25
<b>Grand Total</b>		<b>79.3</b>	<b>100</b>

#### General Description about the Proposed Land Use in planning district:

The major proposed Land uses include residential area of 38.91 Ha (Existing-26.89 Ha) and Mixed-use area of 7.01 Ha (Existing: 0.15 Ha) in the planning district contributing 49.07% and 8.84% respectively. Additionally, an area of 0.41 Ha has been proposed for Commercial, thus making it to a total of 0.58 Ha (Table 12-13).



FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 11 - LUMMAWBAH**



**Legend**

- Baseline Info:**
- National Highway
  - State Highway
  - Major District Road
  - Other District Road
  - Bypass
  - Service Road
  - Major City Road
  - Minor City Road
  - Other Public Road
  - Other Private Road
  - Village road

- Administrative Boundary**
- District Boundary
- Planning Boundary**
- Planning Districts:
  - Inner Ring Road, 9m, 12m
  - Outer Ring Road, 12m
  - Peripheral Ring Road, 18m

- Proposed Roads and Land Use:**
- |                                    |     |     |
|------------------------------------|-----|-----|
| <b>Existing Road to be Widened</b> | 9m  | 9m  |
|                                    | 12m | 12m |
|                                    | 15m | 15m |
|                                    | 18m | 18m |
|                                    | 24m | 24m |
|                                    |     |     |
|                                    |     |     |
- Agriculture & Allied Activities
  - Water Sheet
  - Forest Area
  - Hazards Prone Area

EXI	PRO	CATEGORIES
[Yellow]	[Yellow]	Residential
[Blue]	[Blue]	Commercial
[Green]	[Green]	Mixed
[Purple]	[Purple]	Industrial
[Red]	[Red]	Public & Semi-public
[Brown]	[Brown]	Public Utilities
[Grey]	[Grey]	Transportation
[Light Green]	[Light Green]	Township
[Hatched]	[Hatched]	Defense Area / Military Zone
[Light Blue]	[Light Blue]	Recreational/ Green Buffer/ NDZ



Scale - 1:3,500



Figure 12-13: Proposed Land Use - PD11 - Lummawbah

### 12.3.12 PLANNING DISTRICT NO.12 –MAWPREM

**Area:** 116.15 Hectares

**Location:** Within the core area

**Major Landmarks:** Mahari Petrol Pump, Jessica Residency, Khasi Hills Autonomous District Council, R.P. Chest Hospital Compound, Mawprem Presbyterian Church (*Figure 12-14*).

Table 12-14: Proposed Landuse-PD12-Mawprem

SNo	Categories	Area(Ha)	%age
1	Residential	55.35	47.66
2	Commercial	0.78	0.67
3	Mixed	3.48	3.00
4	Industrial	0.00	0.00
5	Public & Semi public	17.25	14.85
6	Public Utilities	0.44	0.38
7	Transportation	6.05	5.21
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	9.43	8.12
11	Agriculture & Allied Activities	19.87	17.11
12	Water Sheet	3.50	3.01
13	Forest Area	0.00	0.00
14	Hazards Prone Area	0.00	0.00
<b>Grand Total</b>		<b>116.15</b>	<b>100</b>

#### General Description about the Proposed Land use in planning district:

The major proposed Land uses include residential area of 55.35 Ha (Existing-54.68 Ha) and Mixed Use area of 3.48 Ha (Existing: 2.53 Ha) in the planning district contributing 47.66% and 3.00% respectively.

Additionally, an area of 0.174 Ha has been proposed for Commercial and 0.177 Ha for Public Utilities, thus making it to a total of 0.78 Ha and 0.44 Ha respectively (*Table 12-14*).

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 12 - MAWPREM**

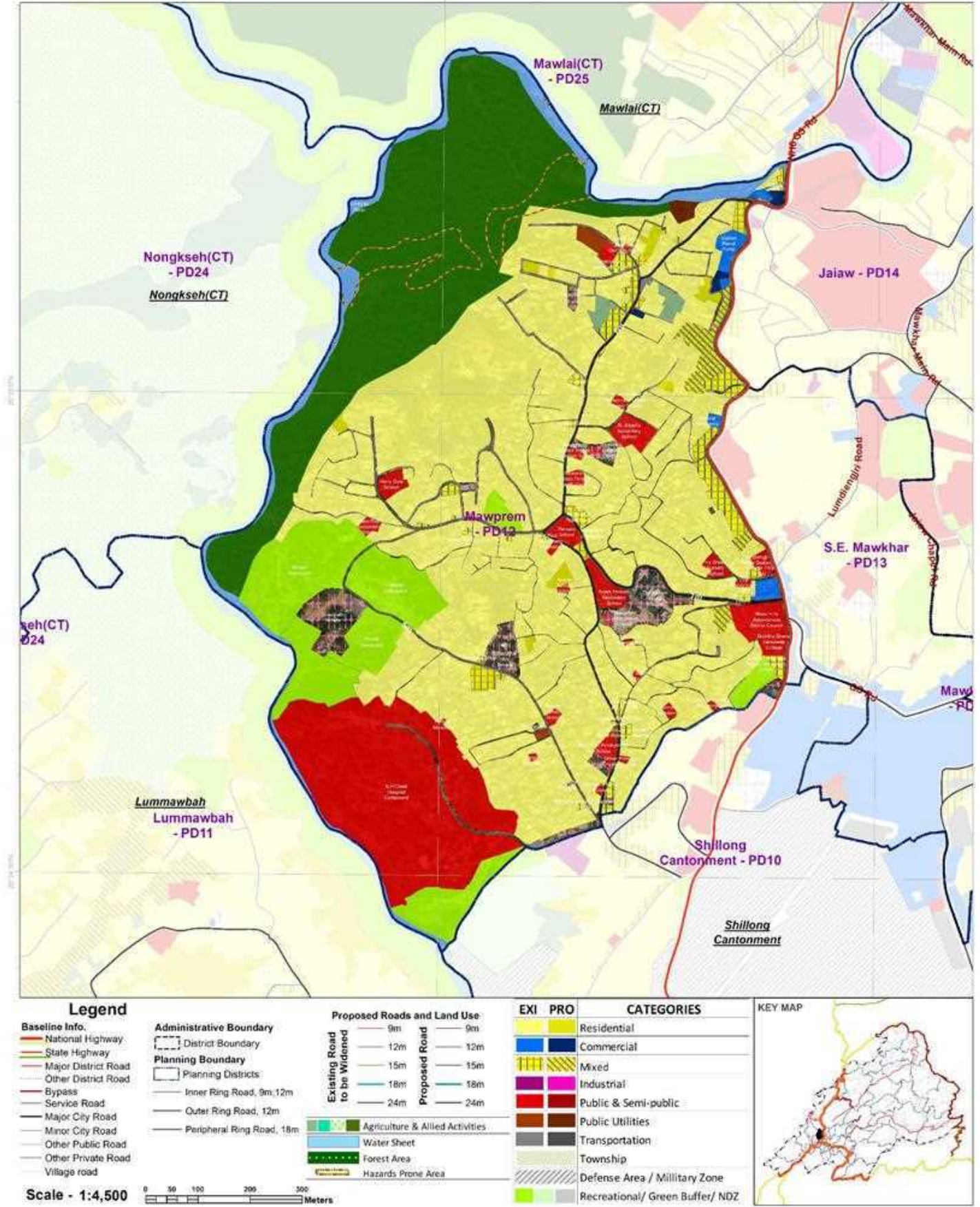


Figure 12-14: Proposed Land Use - PD12 - Mawprem

### 12.3.13 PLANNING DISTRICT NO.13 –S.E. MAWKHAR

**Area:** 33.28 Hectares

**Location:** Within the core area

**Major Landmarks:** Garikhana Junction, Synod College, Lewduh, Bara Bazar Police Point, Sohra Cab Stand (*Figure 12-15*).

Table 12-15: Proposed Landuse-PD13-Mawkhar

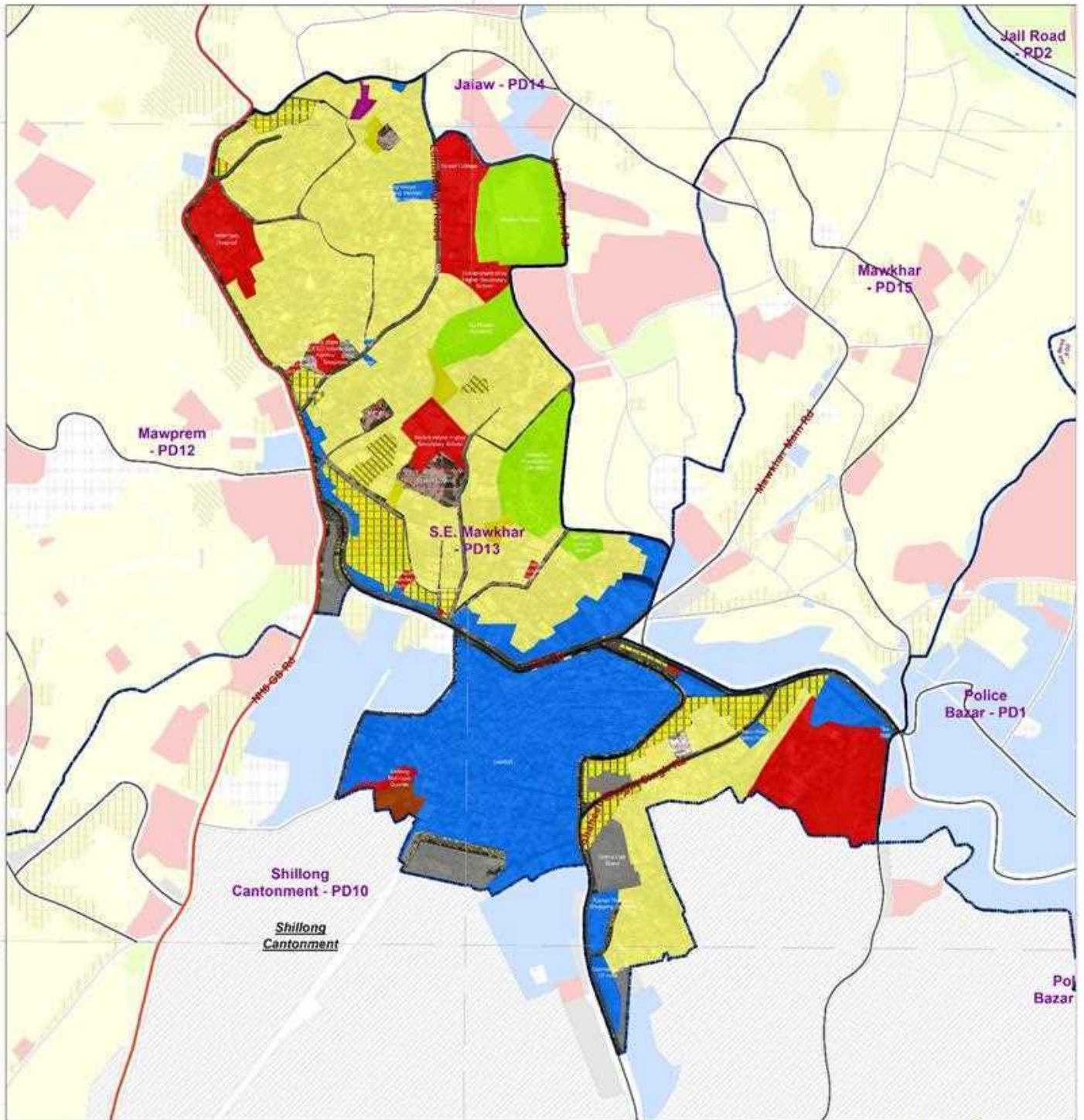
SNo	Categories	Area(Ha)	%age
1	Residential	13.15	39.53
2	Commercial	7.26	21.81
3	Mixed	1.96	5.88
4	Industrial	0.06	0.18
5	Public & Semi public	4.10	12.31
6	Public Utilities	0.16	0.48
7	Transportation	4.08	12.27
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.01
10	Recreational/ Green Buffer/ NDZ	2.50	7.52
11	Agriculture & Allied Activities	0.00	0.00
12	Water Sheet	0.00	0.00
13	Forest Area	0.00	0.00
14	Hazards Prone Area	0.00	0.00
<b>Grand Total</b>		<b>33.28</b>	<b>100</b>

#### General Description about the Proposed Land use in planning district:

The major proposed Land uses include residential area of 13.15 Ha (Existing: 12.9 Ha) and commercial area of 7.26 Ha (Existing: 7.22 Ha) in the planning district contributing 39.53% and 21.81% respectively. However, Transportation contribute maximum at 12.27%.

Additionally, an area of 0.22 Ha has been proposed for Mixed Use, thus making it to a total of 1.96 Ha, representing 5.88% of the total area (*Table 12-15*).

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS -13 - S.E. MAWKHAR**



**Legend**

- Baseline Info.**
- National Highway
  - State Highway
  - Major District Road
  - Other District Road
  - Bypass
  - Service Road
  - Major City Road
  - Minor City Road
  - Other Public Road
  - Other Private Road
  - Village road
- Administrative Boundary**
- District Boundary
  - Planning Districts:
    - Inner Ring Road, 9m, 12m
    - Outer Ring Road, 12m
    - Peripheral Ring Road, 18m

- Proposed Roads and Land Use:**
- | Existing Road to be Widened | Proposed Road |
|-----------------------------|---------------|
| 9m                          | 9m            |
| 12m                         | 12m           |
| 15m                         | 15m           |
| 18m                         | 18m           |
| 24m                         | 24m           |
- Agriculture & Allied Activities
  - Water Sheet
  - Forest Area
  - Hazards Prone Area

EXI	PRO	CATEGORIES
[Yellow]	[Yellow]	Residential
[Blue]	[Blue]	Commercial
[Green]	[Green]	Mixed
[Red]	[Red]	Industrial
[Orange]	[Orange]	Public & Semi-public
[Grey]	[Grey]	Public Utilities
[Light Blue]	[Light Blue]	Transportation
[White]	[White]	Township
[Hatched]	[Hatched]	Defense Area / Military Zone
[Light Green]	[Light Green]	Recreational/ Green Buffer/ NDZ



Scale - 1:3,000

Figure 12-15: Proposed Land Use - PD13 - Mawkhar



### 12.3.14 PLANNING DISTRICT NO.14 – JAIW

**Area:** 60.05 Hectares

**Location:** Within the core area

**Major Landmarks:** Madan Weiking, Seng Khasi Higher Secondary School, Dr. H. Gordon Roberts Hospital, Mawkhar Presbyterian Church (*Figure 12-16*).

Table 12-16: Proposed Landuse-PD14-Jaiaw

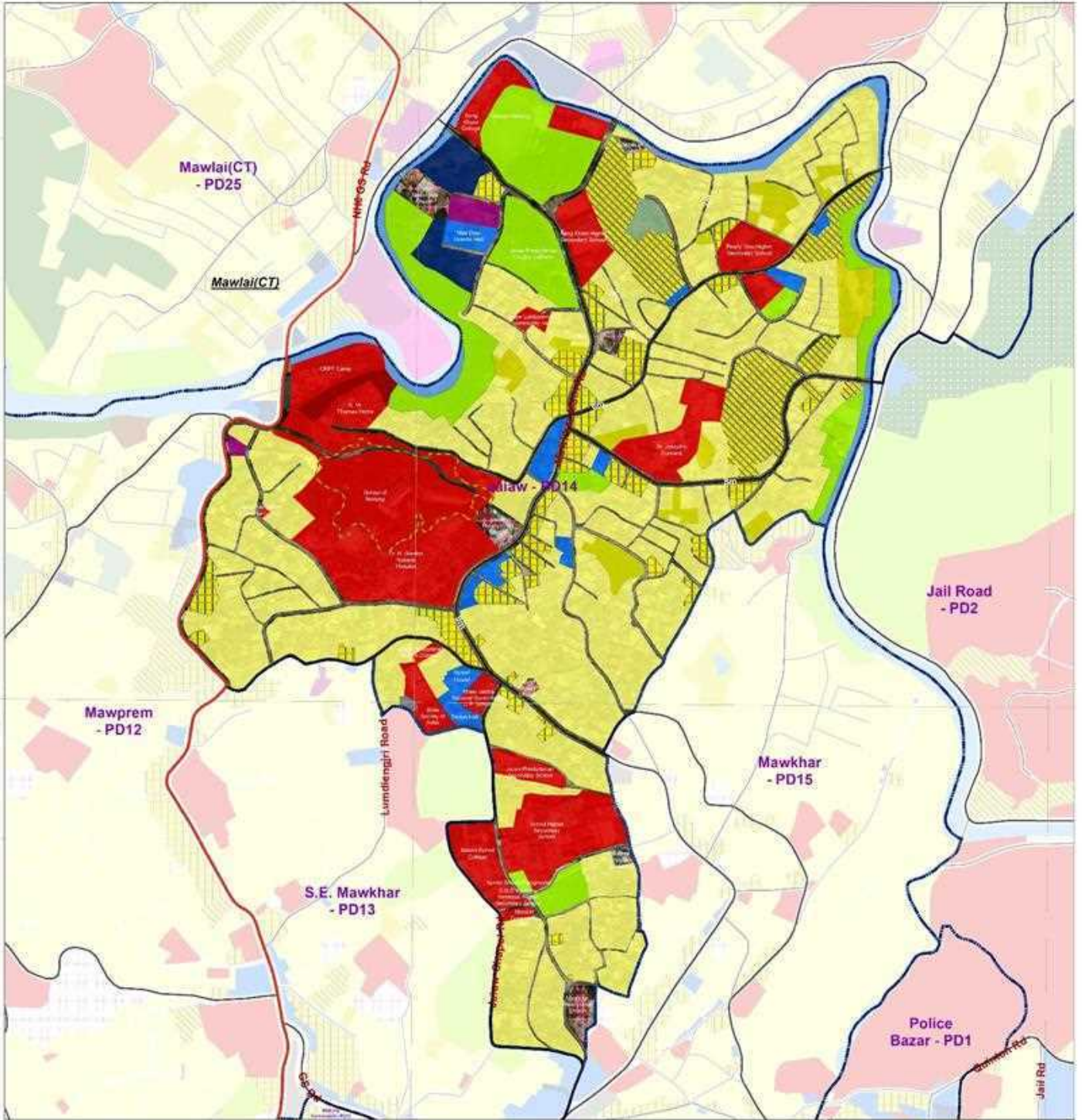
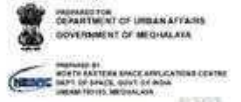
SNo	Categories	Area(Ha)	%age
1	Residential	26.84	44.70
2	Commercial	1.93	3.22
3	Mixed	5.46	9.08
4	Industrial	0.27	0.44
5	Public & Semi public	12.13	20.20
6	Public Utilities	0.00	0.00
7	Transportation	6.30	10.49
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	5.29	8.80
11	Agriculture & Allied Activities	0.20	0.33
12	Water Sheet	1.64	2.73
13	Forest Area	0.00	0.00
14	Hazards Prone Area	0.00	0.00
<b>Grand Total</b>		<b>60.05</b>	<b>100</b>

#### General Description about the Proposed Land use in planning district:

The major proposed Land uses include residential area of 26.84 Ha (Existing-25.17 Ha) and Mixed-use area of 5.46 Ha (Existing: 2.56 Ha) in the planning district contributing 44.7% and 9.08% respectively. However, Public & Semi-public contribute maximum at 20.20%.

Additionally, an area of 0.83 Ha has been proposed for Commercial, thus making it to a total of 1.93 Ha, representing 3.22% of the total area (*Table 12-16*).

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 14 - JAIAW**



**Legend**

- Baseline Info:**
- National Highway
  - State Highway
  - Major District Road
  - Other District Road
  - Bypass
  - Service Road
  - Major City Road
  - Minor City Road
  - Other Public Road
  - Other Private Road
  - Village road

- Administrative Boundary**
- District Boundary
- Planning Boundary**
- Planning Districts:
  - Inner Ring Road, 9m, 12m
  - Outer Ring Road, 12m
  - Peripheral Ring Road, 18m

- Proposed Roads and Land Use:**
- |                                    |                      |
|------------------------------------|----------------------|
| <b>Existing Road to be Widened</b> | <b>Proposed Road</b> |
| 9m                                 | 9m                   |
| 12m                                | 12m                  |
| 15m                                | 15m                  |
| 18m                                | 18m                  |
| 24m                                | 24m                  |
- Agriculture & Allied Activities
  - Water Sheet
  - Forest Area
  - Hazards Prone Area

EXI	PRO	CATEGORIES
[Yellow]	[Yellow]	Residential
[Blue]	[Blue]	Commercial
[Green]	[Green]	Mixed
[Purple]	[Purple]	Industrial
[Red]	[Red]	Public & Semi-public
[Brown]	[Brown]	Public Utilities
[Grey]	[Grey]	Transportation
[Hatched]	[Hatched]	Township
[Dark Grey]	[Dark Grey]	Defense Area / Military Zone
[Light Green]	[Light Green]	Recreational/ Green Buffer/ NDZ

**KEY MAP**



Scale - 1:3,500



Figure 12-16: Proposed Land Use - PD14 - Jaiaw



### 12.3.15 PLANNING DISTRICT NO.15 – MAWKHAR

**Area:** 29.56 Hectares

**Location:** Within the core area

**Major Landmarks:** Mothphran point, Ri Khasi Press, Seng Khasi Hall, Christian Academy, Mawkhar Presbyterian Church (*Figure 12-17*).

**Table 12-17: Proposed Landuse-PD15-Mawkhar**

SNo	Categories	Area(Ha)	%age
1	Residential	19.93	67.45
2	Commercial	1.40	4.75
3	Mixed	1.80	6.10
4	Industrial	0.00	0.00
5	Public & Semi public	2.16	7.30
6	Public Utilities	0.00	0.01
7	Transportation	3.04	10.29
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	0.49	1.66
11	Agriculture & Allied Activities	0.00	0.00
12	Water Sheet	0.72	2.43
13	Forest Area	0.00	0.00
14	Hazards Prone Area	0.00	0.00
<b>Grand Total</b>		<b>29.56</b>	<b>100</b>

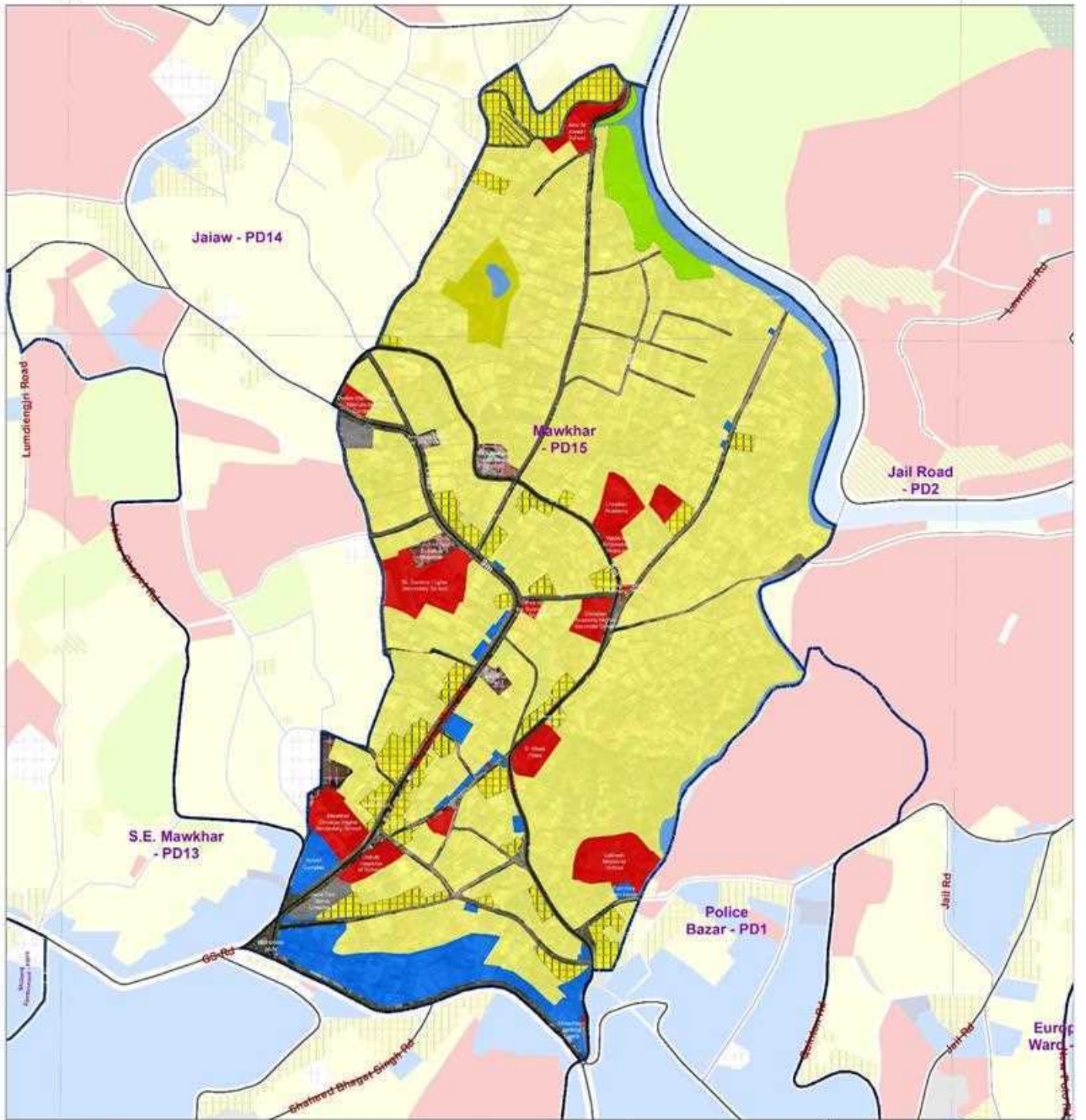
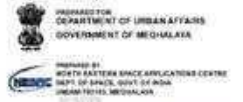
**General Description about the Proposed Land use in planning district:**

The main land use category in Mawkhar is residential area, which covers 67.45% of the total area. The second most dominant land-use category is Transportation (10.29%) followed by Public & Semi-Public (7.30%) (*Table 12-17*).

The major land use proposed in this area is mixed use of 1.80 Ha (Existing: 1.74 Ha) contributing 6.10% of the total area.



FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 15 - MAWKHAR**



**Legend**

- Baseline Info:**
- National Highway
  - State Highway
  - Major District Road
  - Other District Road
  - Bypass
  - Service Road
  - Major City Road
  - Minor City Road
  - Other Public Road
  - Other Private Road
  - Village road

- Administrative Boundary**
- District Boundary
- Planning Boundary**
- Planning Districts:
  - Inner Ring Road, 9m, 12m
  - Outer Ring Road, 12m
  - Peripheral Ring Road, 18m

- Proposed Roads and Land Use:**
- | Existing Road to be Widened | Proposed Road |
|-----------------------------|---------------|
| 9m                          | 9m            |
| 12m                         | 12m           |
| 15m                         | 15m           |
| 18m                         | 18m           |
| 24m                         | 24m           |
- Agriculture & Allied Activities
  - Water Sheet
  - Forest Area
  - Hazards Prone Area

EXI	PRO	CATEGORIES
[Yellow]	[Yellow]	Residential
[Blue]	[Blue]	Commercial
[Green]	[Green]	Mixed
[Purple]	[Purple]	Industrial
[Red]	[Red]	Public & Semi-public
[Brown]	[Brown]	Public Utilities
[Grey]	[Grey]	Transportation
[Light Green]	[Light Green]	Township
[Hatched]	[Hatched]	Defense Area / Military Zone
[Light Blue]	[Light Blue]	Recreational/ Green Buffer/ NDZ

**KEY MAP**



Scale - 1:2,500



Figure 12-17: Proposed Land Use - PD15 - Mawkhar

### 12.3.16 PLANNING DISTRICT NO.16 – PYNTHORMUKHRAH (CT)

**Area:** 276.33 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** The Golf Course, Polo Ground, Enforcement Directorate, Shillong Sub Zonal Office, Training Institute of Bellefonte, Saw Aiom Swimming Pool (*Figure 12-18*).

**Table 12-18: Proposed Landuse-PD16-Pynthormukhrah**

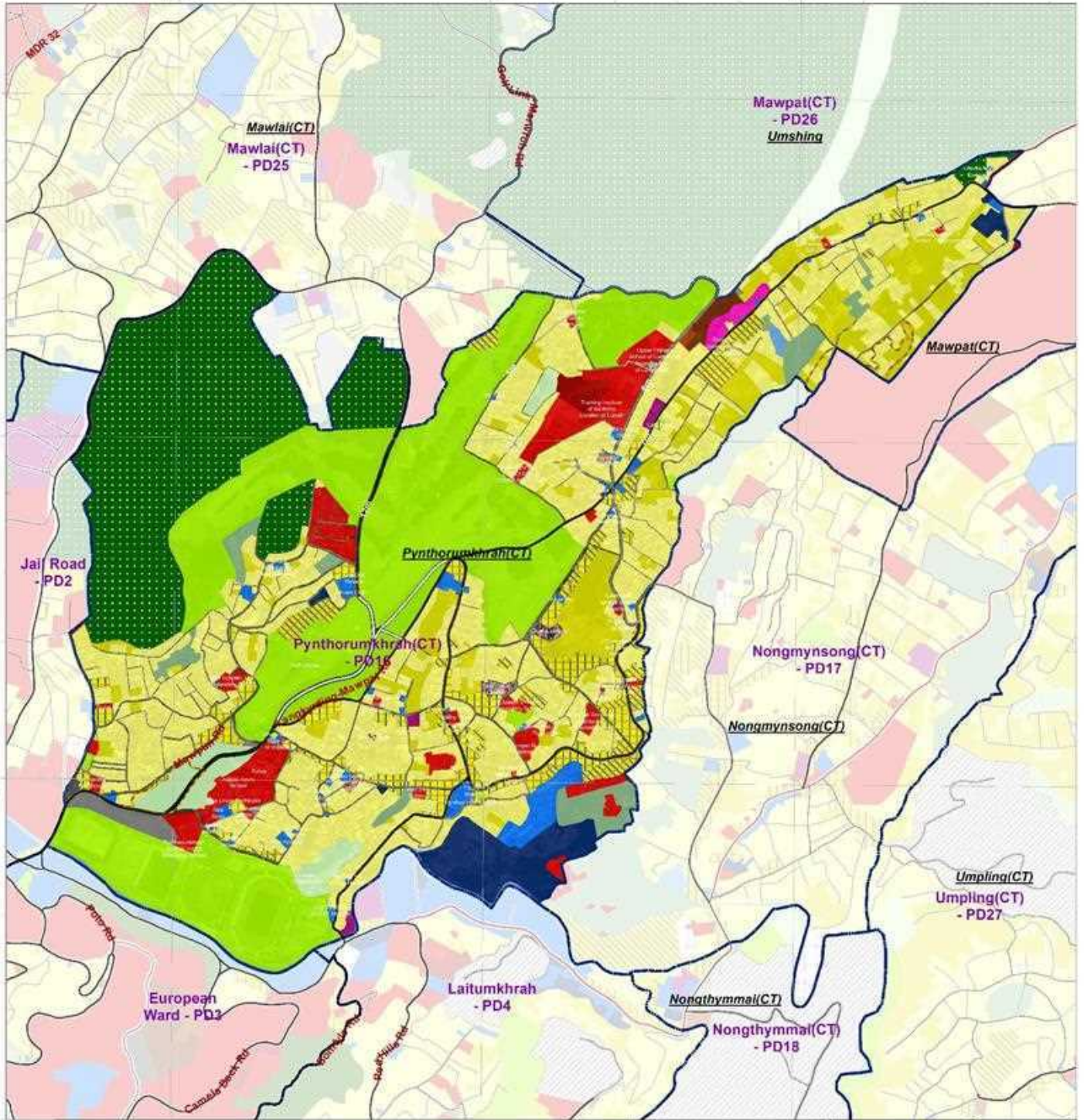
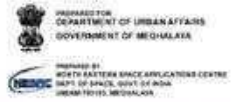
SNo	Categories	Area(Ha)	%age
1	Residential	95.62	34.61
2	Commercial	10.81	3.91
3	Mixed	15.14	5.48
4	Industrial	1.32	0.48
5	Public & Semi0public	12.67	4.59
6	Public Utilities	0.81	0.29
7	Transportation	19.66	7.11
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	70.29	25.44
11	Agriculture & Allied Activities	6.62	2.39
12	Water Sheet	1.20	0.44
13	Forest Area	42.16	15.26
14	Hazards Prone Area	0.00	0.00
<b>Grand Total</b>		<b>276.33</b>	<b>100</b>

**General Description about the Proposed Land use in planning district:**

The major proposed Land uses include residential area of 95.62 Ha (Existing: 75.43 Ha) and commercial area of 10.81 Ha (Existing: 4.12 Ha) in the planning district contributing 34.61% and 3.91% respectively. However, Recreational/ Green Buffer/ NDZ contribute maximum at 25.44% having an additional proposed area of 2.01 Ha (Existing: 65.72 Ha).

Additionally, a length of around 1000m pedestrian way is been proposed for transportation, details is present in section 7.2.3.1, thus making it to a total of 19.66 Ha. The other proposed Land uses are Mixed (15.14 Ha), Industrial (1.32 Ha) and Public utilities (0.81 Ha) (*Table 12-18*).

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
PLANNING DISTRICTS - 16 - PYNTHORUMKHRAH(CT)



**Legend**

- Baseline Info:**
- National Highway
  - State Highway
  - Major District Road
  - Other District Road
  - Bypass
  - Service Road
  - Major City Road
  - Minor City Road
  - Other Public Road
  - Other Private Road
  - Village road

- Administrative Boundary**
- District Boundary
- Planning Boundary**
- Planning Districts:
  - Inner Ring Road, 9m, 12m
  - Outer Ring Road, 12m
  - Peripheral Ring Road, 18m
  - Proposed Pedestrian

- Proposed Roads and Land Use:**
- |                             |               |
|-----------------------------|---------------|
| Existing Road to be Widened | Proposed Road |
| 9m                          | 9m            |
| 12m                         | 12m           |
| 15m                         | 15m           |
| 18m                         | 18m           |
| 24m                         | 24m           |
- Agriculture & Allied Activities
  - Water Sheet
  - Forest Area
  - Hazards Prone Area

EXI	PRO	CATEGORIES
[Yellow]	[Yellow]	Residential
[Blue]	[Blue]	Commercial
[Green]	[Green]	Mixed
[Red]	[Red]	Industrial
[Purple]	[Purple]	Public & Semi-public
[Brown]	[Brown]	Public Utilities
[Grey]	[Grey]	Transportation
[Light Green]	[Light Green]	Township
[Dark Green]	[Dark Green]	Defense Area / Military Zone
[Light Blue]	[Light Blue]	Recreational/ Green Buffer/ NDZ

**KEY MAP**



Scale - 1:7,000

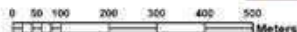


Figure 12-18: Proposed Land Use - PD16 - Pynthormukhrah



### 12.3.17 PLANNING DISTRICT NO.17 – NONGMYNSONG (CT)

**Area:** 139.51 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** BDW International School, Pentecostal Mission Centre Faith Home, St. Jerome's Church, Atomic Mineral Directorate (*Figure 12-19*).

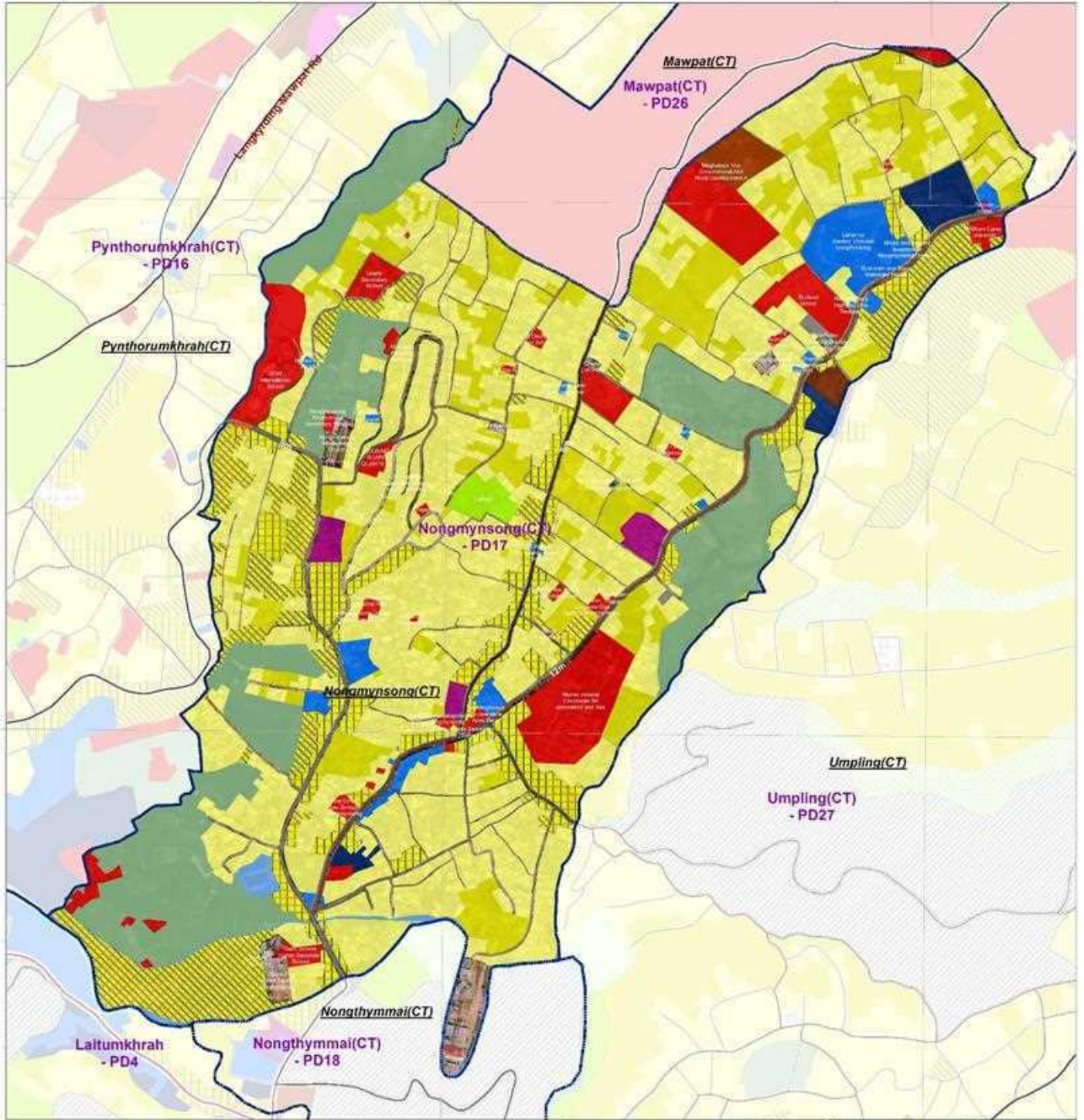
**Table 12-19: Proposed Landuse-PD17-Nongmynsong**

SNo	Categories	Area(Ha)	%age
1	Residential	70.64	50.63
2	Commercial	4.90	3.51
3	Mixed	17.42	12.48
4	Industrial	1.05	0.76
5	Public & Semi0public	11.52	8.26
6	Public Utilities	1.16	0.83
7	Transportation	10.35	7.42
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	0.66	0.47
11	Agriculture & Allied Activities	20.64	14.79
12	Water Sheet	1.17	0.84
13	Forest Area	0.00	0.00
14	Hazards Prone Area	0.00	0.00
<b>Grand Total</b>		<b>139.51</b>	<b>100</b>

**General Description about the Proposed Land use in planning district:**

The major proposed Land uses include residential area of 70.64 Ha (Existing: 54.59 Ha) and mixed use area of 17.42 Ha (Existing: 7.99 Ha) in the planning district contributing 50.63% and 12.48% respectively. However, agriculture and allied activities contribute maximum at 14.79%. Additionally, an area of 1.51 Ha has been proposed for Commercial, thus making it to a total of 4.90 Ha. The other proposed Land uses are Public utilities (1.16 Ha) and Recreational/ Green Buffer/ NDZ (0.66 Ha) (*Table 12-19*).

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
PLANNING DISTRICTS - 17 - NONGMYNSONG(CT)



**Legend**

- Baseline Info:**
- National Highway
  - State Highway
  - Major District Road
  - Other District Road
  - Bypass
  - Service Road
  - Major City Road
  - Minor City Road
  - Other Public Road
  - Other Private Road
  - Village road

- Administrative Boundary**
- District Boundary
- Planning Boundary**
- Planning Districts:
  - Inner Ring Road, 9m, 12m
  - Outer Ring Road, 12m
  - Peripheral Ring Road, 18m

- Proposed Roads and Land Use:**
- |                             |               |
|-----------------------------|---------------|
| Existing Road to be Widened | Proposed Road |
| 9m                          | 9m            |
| 12m                         | 12m           |
| 15m                         | 15m           |
| 18m                         | 18m           |
| 24m                         | 24m           |
- Agriculture & Allied Activities
  - Water Sheet
  - Forest Area
  - Hazards Prone Area

EXI	PRO	CATEGORIES
[Yellow]	[Yellow]	Residential
[Blue]	[Blue]	Commercial
[Green]	[Green]	Mixed
[Purple]	[Purple]	Industrial
[Red]	[Red]	Public & Semi-public
[Brown]	[Brown]	Public Utilities
[Grey]	[Grey]	Transportation
[Light Green]	[Light Green]	Township
[Hatched]	[Hatched]	Defense Area / Military Zone
[Light Blue]	[Light Blue]	Recreational/ Green Buffer/ NDZ



Scale - 1:4,500



Figure 12-19: Proposed Land Use - PD17 - Nongmynsong



### 12.3.18 PLANNING DISTRICT NO.18 – NONGTHYMMAI (CT)

**Area:** 326.78 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** Fire Bridge, NEC, Assam Rifle house, IIM, NIFT, Jelly Shop Point, St. Dominic College, GSI (Figure 12-20).

Table 12-20: Proposed Landuse-PD18-Nongthymmai

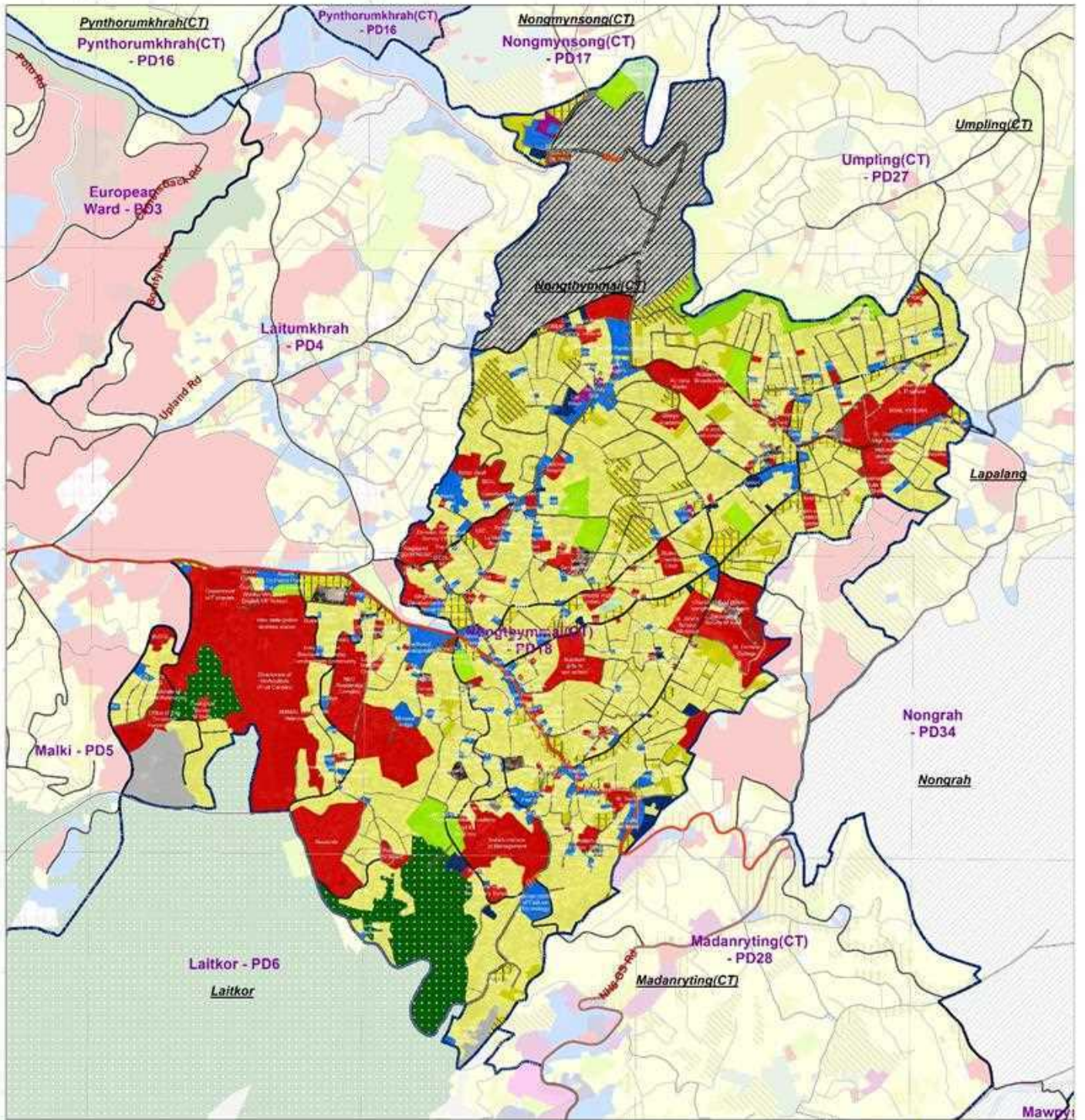
SNo	Categories	Area(Ha)	%age
1	Residential	141.11	43.18
2	Commercial	15.80	4.83
3	Mixed	16.67	5.10
4	Industrial	0.66	0.20
5	Public & Semipublic	63.59	19.46
6	Public Utilities	0.37	0.11
7	Transportation	28.26	8.65
8	Township	0.00	0.00
9	Defense Area / Military Zone	31.69	9.70
10	Recreational/ Green Buffer/ NDZ	13.87	4.24
11	Agriculture & Allied Activities	0.00	0.00
12	Water Sheet	1.33	0.41
13	Forest Area	13.42	4.11
14	Hazards Prone Area	0.00	0.00
<b>Grand Total</b>		<b>326.78</b>	<b>100</b>

**General Description about the Proposed Land use in planning district:**

The major proposed Land uses include residential area of 141.11 Ha (Existing: 135.94 Ha) and commercial area of 15.8 Ha (Existing: 13.60 Ha) in the planning district contributing 43.18% and 4.83% respectively. However, Public & Semi-public contribute maximum at 19.46%. Additionally, an area of 1.03 Ha has been proposed for Recreational/ Green Buffer/ NDZ, thus making it to a total of 13.87 Ha (Table 12-20).

Other land use proposed in this area is mixed use of 16.67 Ha (Existing-10.72 Ha) contributing 5.10% of the total area.

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 18 - NONGTHYMMAI(CT)**



Legend		Proposed Roads and Land Use		EXI	PRO	CATEGORIES	KEY MAP
<b>Baseline Info:</b> National Highway State Highway Major District Road Other District Road Bypass Service Road Major City Road Minor City Road Other Public Road Other Private Road Village road	<b>Administrative Boundary</b> District Boundary <b>Planning Boundary</b> Planning Districts: Inner Ring Road, 9m, 12m Outer Ring Road, 12m Peripheral Ring Road, 18m	<b>Existing Road to be Widened</b> 9m 12m 15m 18m 24m	<b>Proposed Road</b> 9m 12m 15m 18m 24m	Agriculture & Allied Activities Water Sheet Forest Area Hazards Prone Area	Residential Commercial Mixed Industrial Public & Semi-public Public Utilities Transportation Township Defense Area / Military Zone Recreational/ Green Buffer/ NDZ	Residential Commercial Mixed Industrial Public & Semi-public Public Utilities Transportation Township Defense Area / Military Zone Recreational/ Green Buffer/ NDZ	

Scale - 1:8,000

0 50 100 200 300 400 500 Meters

Figure 12-20: Proposed Land Use - PD18 - Nongthymmai



### 12.3.19 PLANNING DISTRICT NO.19 –LAWSOHTUN

**Area:** 630.33 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** Shillong View Point, Sankardev College, Lawsohtun Community hall  
(Figure 12-21).

Table 12-21: Proposed Landuse-PD19-Lawsohtun

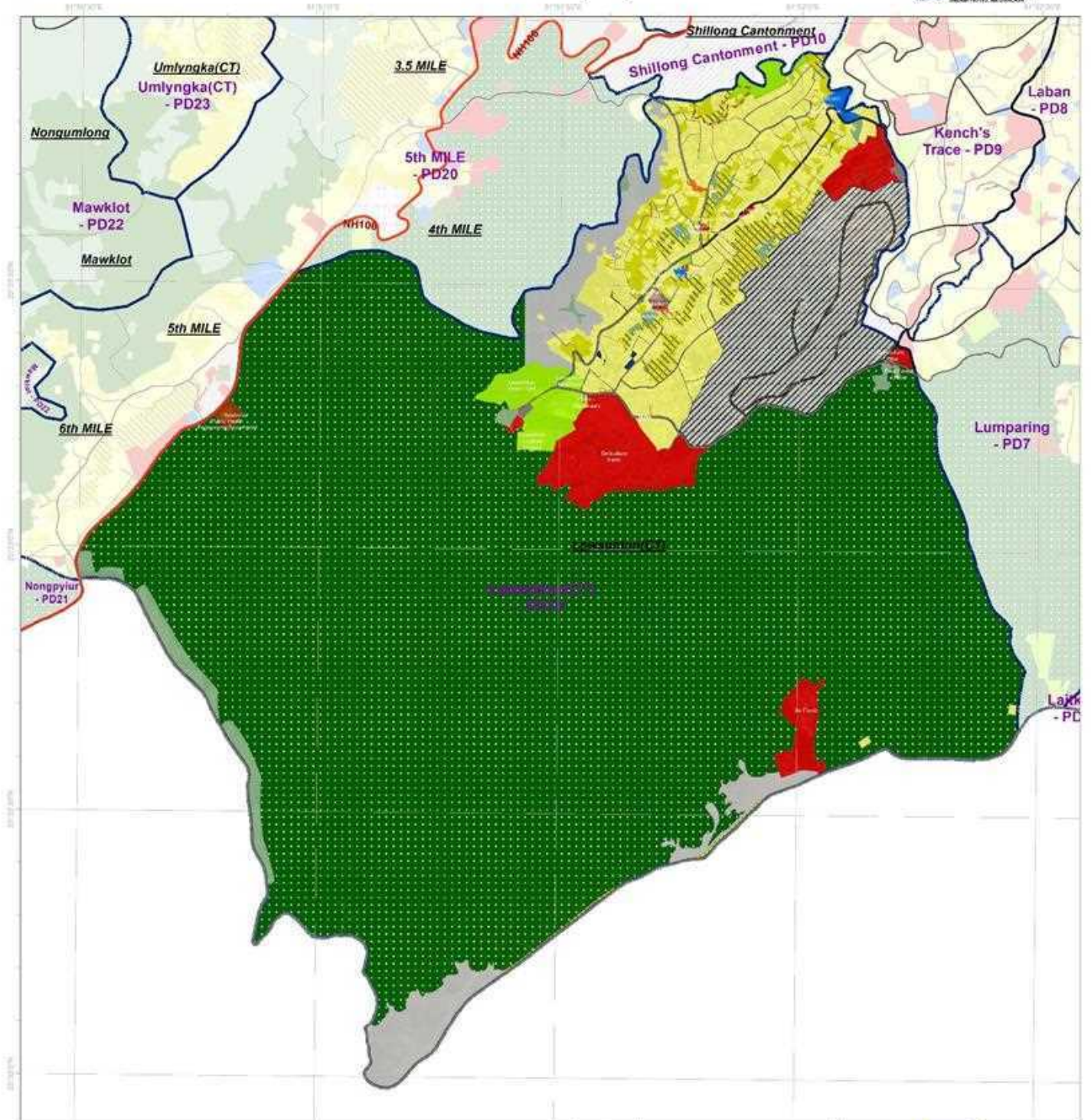
SNo	Categories	Area(Ha)	%age
1	Residential	49.79	7.90
2	Commercial	0.88	0.14
3	Mixed	8.53	1.35
4	Industrial	0.00	0.00
5	Public & Semi0public	20.31	3.22
6	Public Utilities	0.54	0.09
7	Transportation	12.68	2.01
8	Township	0.00	0.00
9	Defense Area / Military Zone	35.25	5.59
10	Recreational/ Green Buffer/ NDZ	29.25	4.64
11	Agriculture & Allied Activities	7.36	1.17
12	Water Sheet	1.22	0.19
13	Forest Area	464.54	73.70
14	Hazards Prone Area	0.00	0.00
<b>Grand Total</b>		<b>630.33</b>	<b>100</b>

#### General Description about the Proposed Land Use in planning district:

The Lawsohtun (CT) table shows that the majority of the land in the area is forest area (73.70%). The major proposed Land uses include residential area of 49.79 Ha (Existing: 42.55Ha) and commercial area of 0.88 Ha (Existing: 0.76 Ha) in the planning district contributing 7.9% and 0.14% respectively. However, unclassified area contribute maximum at 5.59%. Additionally, an area has been proposed for Recreational/ Green Buffer/ NDZ, thus making it to a total of 29.25 Ha (Table 12-21).



FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 19 - LAWSOHTUN(CT)**

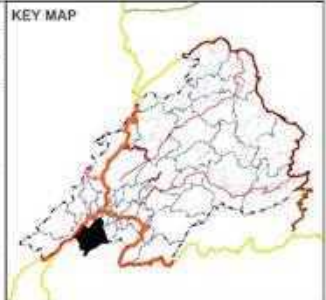


**Legend**

- Baseline Info:**  
 - National Highway  
 - State Highway  
 - Major District Road  
 - Other District Road  
 - Bypass  
 - Service Road  
 - Major City Road  
 - Minor City Road  
 - Other Public Road  
 - Other Private Road  
 - Village road
- Administrative Boundary**  
 - District Boundary  
**Planning Boundary**  
 - Planning Districts:  
 - Inner Ring Road, 9m, 12m  
 - Outer Ring Road, 12m  
 - Peripheral Ring Road, 18m

- Proposed Roads and Land Use:**
- |                                    |                      |
|------------------------------------|----------------------|
| <b>Existing Road to be Widened</b> | <b>Proposed Road</b> |
| 9m                                 | 9m                   |
| 12m                                | 12m                  |
| 15m                                | 15m                  |
| 18m                                | 18m                  |
| 24m                                | 24m                  |
- Agriculture & Allied Activities  
 - Water Sheet  
 - Forest Area  
 - Hazards Prone Area

EXI	PRO	CATEGORIES
[Yellow]	[Yellow]	Residential
[Blue]	[Blue]	Commercial
[Green]	[Green]	Mixed
[Red]	[Red]	Industrial
[Red]	[Red]	Public & Semi-public
[Brown]	[Brown]	Public Utilities
[Grey]	[Grey]	Transportation
[Grey]	[Grey]	Township
[Hatched]	[Hatched]	Defense Area / Military Zone
[Light Green]	[Light Green]	Recreational/ Green Buffer/ NDZ



Scale - 1:9,000  
 0 50 100 200 300 400 500 Meters

Figure 12-21: Proposed Land Use - PD19 - Lawsohtun



### 12.3.20 PLANNING DISTRICT NO.20 – 5TH MILE

**Area:** 225.1 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** IMD, Forest & Environment Department, Don Bosco Sunnyside, St. Paul's Apostolic Campus (*Figure 12-22*).

Table 12-22: Proposed Landuse-PD20-5<sup>th</sup> Mile

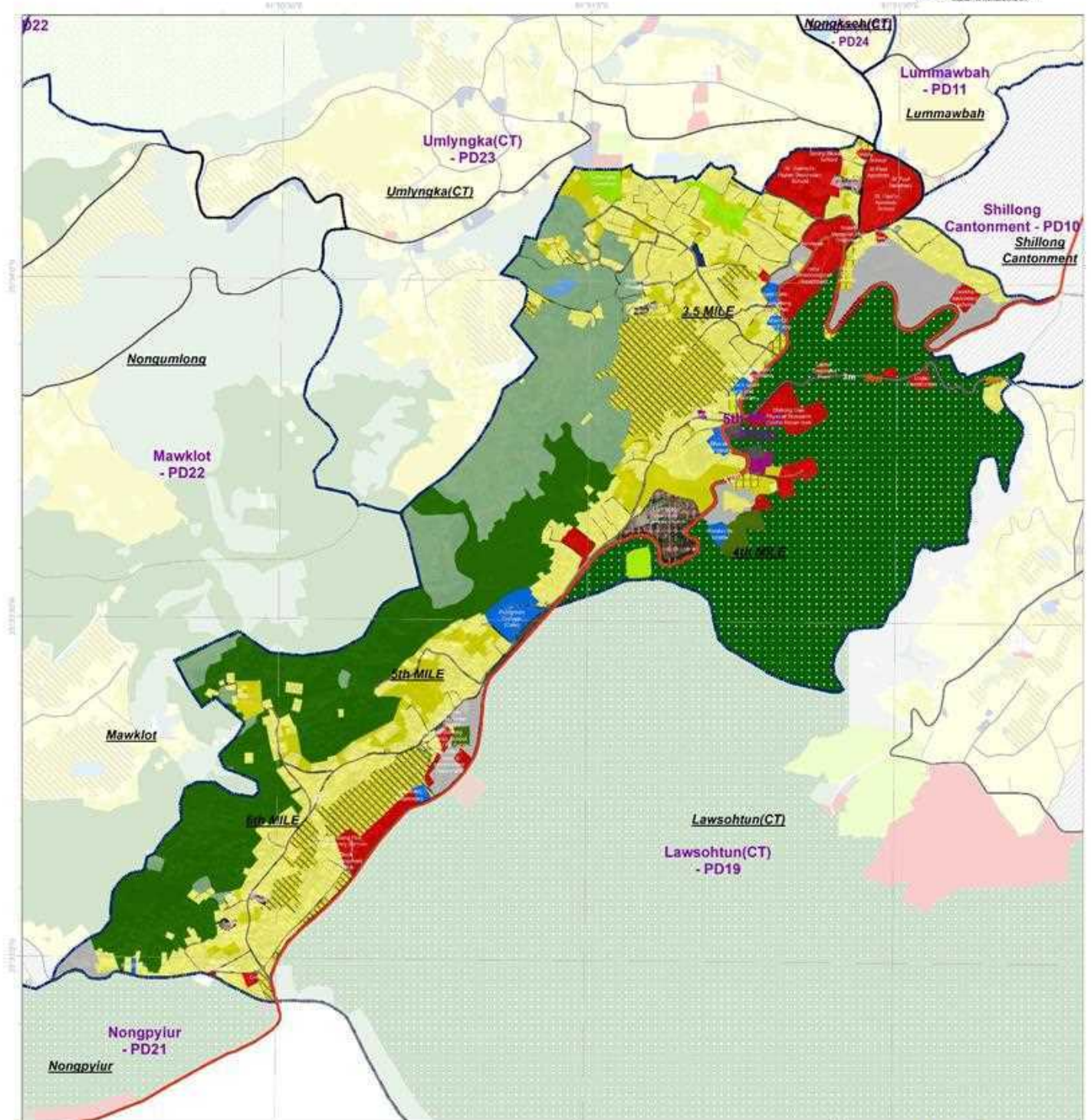
SNo	Categories	Area(Ha)	%age
1	Residential	53.57	23.81
2	Commercial	2.55	1.13
3	Mixed	14.75	6.56
4	Industrial	0.32	0.14
5	Public & Semi0public	15.80	7.02
6	Public Utilities	0.13	0.06
7	Transportation	11.32	5.03
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	10.25	4.56
11	Agriculture & Allied Activities	63.40	28.18
12	Water Sheet	0.27	0.12
13	Forest Area	52.64	23.40
14	Hazards Prone Area	0.00	0.00
<b>Grand Total</b>		<b>225.1</b>	<b>100</b>

#### General Description about the Proposed Land Use in planning district:

The 56th Mile table shows that the majority of the land in the area is forest area (23.40%). The major proposed Land uses include residential area of 53.57 Ha (Existing: 43.56 Ha) and transportation of 11.32 Ha (Existing: 10.75 Ha) in the planning district contributing 23.81% and 5.03% respectively. Additionally, an area of 0.11 Ha has been proposed for commercial, thus making it to a total of 2.55 Ha.

Other land use proposed in this area is Recreational/ Green Buffer/ NDZ of 10.25 Ha (Existing: 3.42 Ha) contributing 4.56% of the total area (*Table 12-22*).

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
PLANNING DISTRICTS - 20 - 5TH MILE



Legend		Proposed Roads and Land Use		EXI	PRO	CATEGORIES	KEY MAP	
<b>Baseline Info:</b> National Highway State Highway Major District Road Other District Road Bypass Service Road Major City Road Minor City Road Other Public Road Other Private Road Village road		<b>Administrative Boundary</b> District Boundary <b>Planning Boundary</b> Planning Districts: Inner Ring Road, 9m, 12m Outer Ring Road, 12m Peripheral Ring Road, 18m		<b>Existing Road to be Widened</b> 9m 12m 15m 18m 24m	<b>Proposed Road</b> 9m 12m 15m 18m 24m	Agriculture & Allied Activities Water Sheet Forest Area Hazards Prone Area	Residential Commercial Mixed Industrial Public & Semi-public Public Utilities Transportation Township Defense Area / Military Zone Recreational/ Green Buffer/ NDZ	
<b>Scale - 1:7,000</b> 0 50 100 200 300 400 500 Meters								

Figure 12-22: Proposed Land Use - PD20 – 5th Mile



### 12.3.21 PLANNING DISTRICT NO.21 – NONGPYIUR

**Area:** 607.19 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** Orchidarium, Elephant Falls, Animal Husbandry and Veterinary Office (Figure 12-23).

Table 12-23: Proposed Landuse-PD21-Nongpyiur

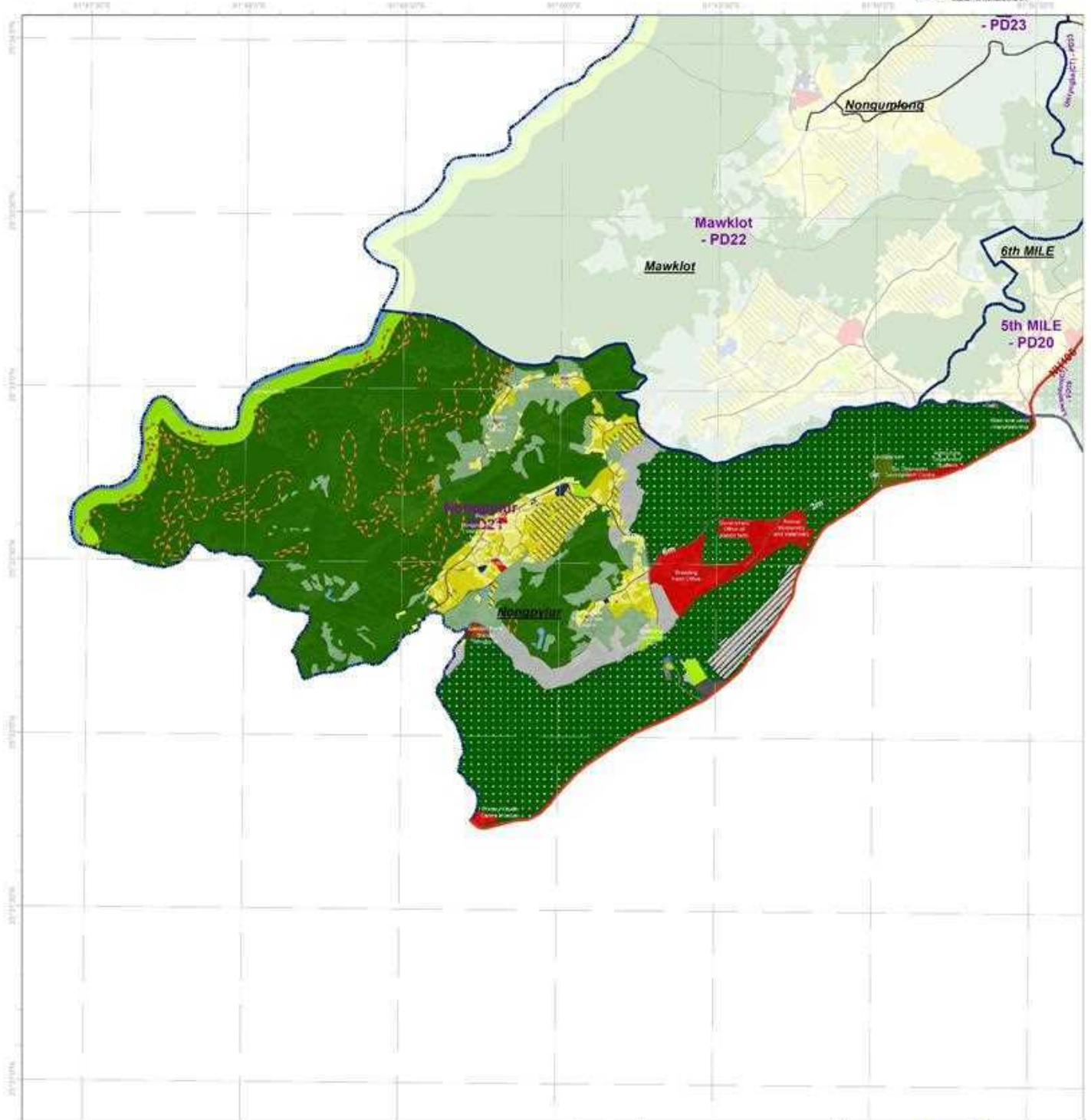
SNo	Categories	Area(Ha)	%age
1	Residential	30.88	5.09
2	Commercial	0.60	0.10
3	Mixed	9.58	1.58
4	Industrial	0.08	0.01
5	Public & Semi0public	19.92	3.28
6	Public Utilities	0.82	0.13
7	Transportation	9.93	1.64
8	Township	0.00	0.00
9	Defense Area / Military Zone	7.92	1.30
10	Recreational/ Green Buffer/ NDZ	44.00	7.25
11	Agriculture & Allied Activities	302.92	49.89
12	Water Sheet	6.12	1.01
13	Forest Area	174.41	28.73
14	Hazards Prone Area	0.00	0.00
<b>Grand Total</b>		<b>607.19</b>	<b>100</b>

#### General Description about the Proposed Land Use in planning district:

The main land use categories in Nongpyiur are Agriculture & Allied Activities and forest area, which covers 49.89% and 28.73% respectively of the total area (Table 12-23).

The major proposed Land uses include residential area of 30.88 Ha (Existing: 15.90 Ha) and transportation of 9.93 Ha (Existing: 9.00 Ha) in the planning district contributing 5.09% and 1.64% respectively. However, agriculture and allied activities contribute maximum at 49.89%. Additionally, an area has been proposed for Recreational/ Green Buffer/ NDZ, thus making it to a total of 44 Ha. The other proposed land uses are Public Utilities (0.82 Ha) and commercial (0.6 Ha).

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 21 - NONGPYIUR**



**Legend**

- Baseline Info:**
- National Highway
  - State Highway
  - Major District Road
  - Other District Road
  - Bypass
  - Service Road
  - Major City Road
  - Minor City Road
  - Other Public Road
  - Other Private Road
  - Village road
- Administrative Boundary**
- District Boundary
- Planning Boundary**
- Planning Districts:
  - Inner Ring Road, 9m, 12m
  - Outer Ring Road, 12m
  - Peripheral Ring Road, 18m

- Proposed Roads and Land Use:**
- | Existing Road to be Widened | Proposed Road |
|-----------------------------|---------------|
| 9m                          | 9m            |
| 12m                         | 12m           |
| 15m                         | 15m           |
| 18m                         | 18m           |
| 24m                         | 24m           |
- Agriculture & Allied Activities
  - Water Sheet
  - Forest Area
  - Hazards Prone Area

EXI	PRO	CATEGORIES
[Yellow]	[Yellow]	Residential
[Blue]	[Blue]	Commercial
[Green]	[Green]	Mixed
[Red]	[Red]	Industrial
[Purple]	[Purple]	Public & Semi-public
[Brown]	[Brown]	Public Utilities
[Grey]	[Grey]	Transportation
[Light Green]	[Light Green]	Township
[Dark Green]	[Dark Green]	Defense Area / Military Zone
[Light Blue]	[Light Blue]	Recreational/ Green Buffer/ NDZ



Scale - 1:14,000 0 100 200 400 600 800 1,000 Meters

Figure 12-23: Proposed Land Use - PD21 - Nongpyiur



### 12.3.22 PLANNING DISTRICT NO.22 – MAWKLOT

**Area:** 747.26 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** John Roberts Theological College, Gas Godown, Nongumlong Football Ground (Figure 12-24).

Table 12-24: Proposed Landuse-PD22-Mawklot

SNo	Categories	Area(Ha)	%age
1	Residential	67.15	8.99
2	Commercial	1.85	0.25
3	Mixed	51.64	6.91
4	Industrial	0.00	0.00
5	Public & Semi public	3.20	0.43
6	Public Utilities	0.00	0.00
7	Transportation	11.48	1.54
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	42.03	5.62
11	Agriculture & Allied Activities	528.38	70.71
12	Water Sheet	14.07	1.88
13	Forest Area	3.83	0.51
14	Hazards Prone Area	23.62	3.16
<b>Grand Total</b>		<b>747.26</b>	<b>100</b>

#### General Description about the Proposed Land Use in planning district:

The main land use categories in Mawklot is agriculture & allied activities, which covers 70.71% of the total area (Table 12-24).

The major proposed Land uses include residential area of 67.15 Ha (Existing: 39.87 Ha) in the planning district contributing 8.89%. Additionally, an area 0.11 Ha has been proposed for Recreational/ Green Buffer/ NDZ, thus making it to a total of 42.03 Ha. The other proposed land uses are Public & Semi-public (3.2 Ha), Commercial (1.85 Ha) and Mixed Use (51.64 Ha).



### 12.3.23 PLANNING DISTRICT NO.23 – UMLYNGKA

**Area:** 394.49 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** Umlyngka Presbyterian Church, Mawkhyndew Trek (Figure 12-25).

Table 12-25: Proposed Landuse-PD23-Umlyngka

SNo	Categories	Area(Ha)	%age
1	Residential	83.05	21.22
2	Commercial	2.39	0.61
3	Mixed	17.25	4.41
4	Industrial	0.00	0.00
5	Public & Semi0public	1.57	0.40
6	Public Utilities	0.00	0.00
7	Transportation	8.06	2.06
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	25.65	6.56
11	Agriculture & Allied Activities	66.07	16.88
12	Water Sheet	7.21	1.84
13	Forest Area	0.00	0.00
14	Hazards Prone Area	80.05	18.01
<b>Grand Total</b>		<b>394.49</b>	<b>100</b>

#### General Description about the Proposed Land Use in planning district:

The main land use categories in Umlyngka is residential, which covers 21.22% of the total area (Table 12-25).

The major proposed Land uses include residential area of 83.05 Ha (Existing: 54.17 Ha) and Mixed use of 17.25 Ha in the planning district contributing 21.22 % and 4.41 % respectively. Additionally, an area 0.38 Ha has been proposed for Recreational/ Green Buffer/ NDZ, thus making it to a total of 25.65 Ha. The other proposed land uses are Public & Semi-public (1.57 Ha) and Commercial (2.39 Ha).



FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 23 - UMLYNGKA(CT)**

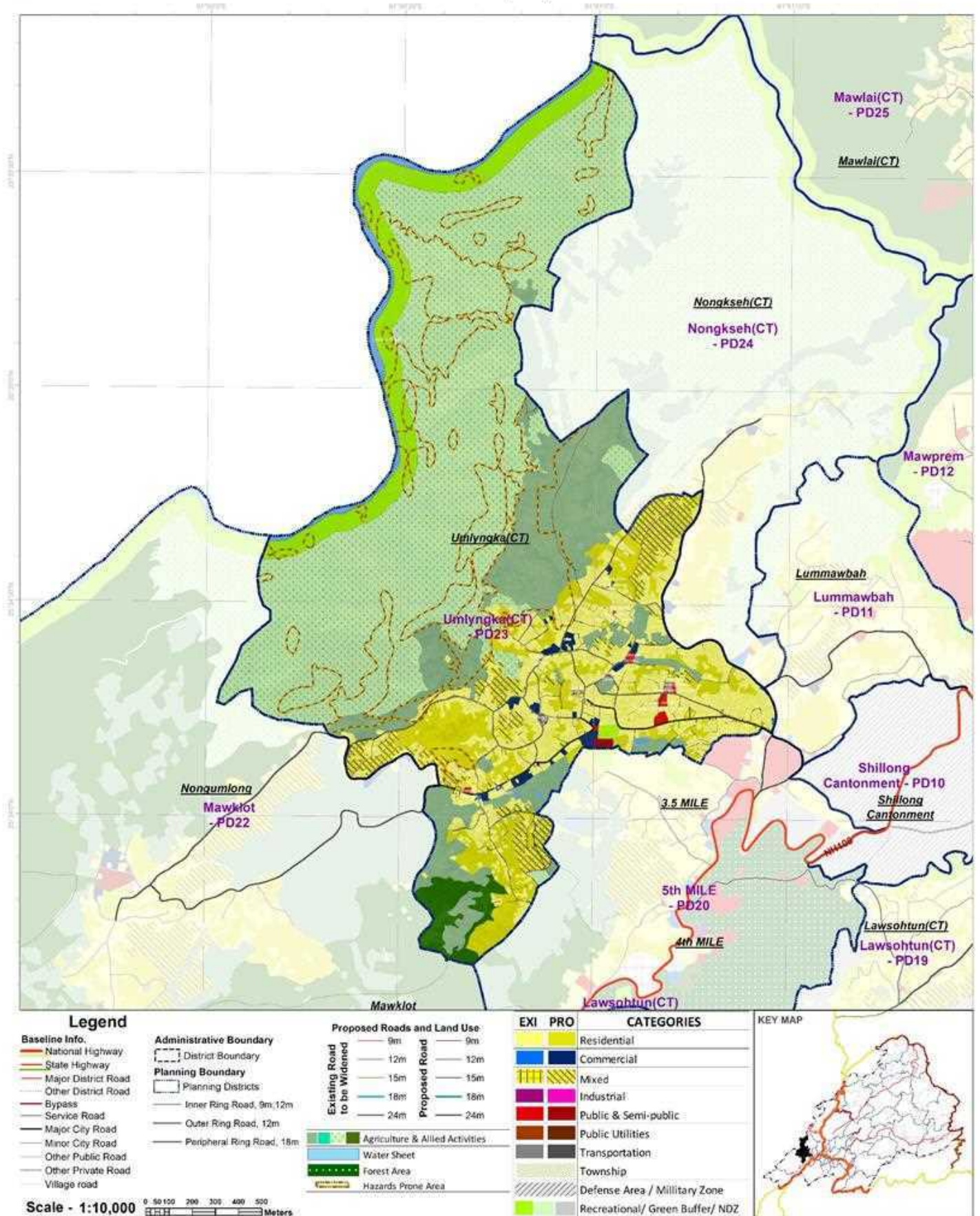


Figure 12-25: Proposed Land Use - PD23 - Umlyngka

### 12.3.24 PLANNING DISTRICT NO.24 – NONGKSEH

**Area:** 273.94 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** Madonna Convent, Nongkseh Rim, Nongkseh View Point (Figure 12-26).

Table 12-26: Proposed Landuse-PD24-Nongkseh

SNo	Categories	Area(Ha)	%age
1	Residential	25.57	9.92
2	Commercial	1.11	0.43
3	Mixed	2.36	0.92
4	Industrial	0.00	0.00
5	Public & Semi0public	0.19	0.07
6	Public Utilities	0.00	0.00
7	Transportation	2.22	0.86
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	17.57	6.82
11	Agriculture & Allied Activities	35.79	13.88
12	Water Sheet	4.95	1.92
13	Forest Area	0.00	0.00
14	Hazards Prone Area	68.04	26.18
<b>Grand Total</b>		<b>273.94</b>	<b>100</b>

#### General Description about the Proposed Land use in planning district:

The main land use categories in Nongkseh is agriculture & allied activities, which covers 13.88% of the total area. However, Hazards Prone Area contribute maximum at 26.18% (Table 12-26).

The major proposed land uses include residential area of 25.57 Ha (Existing: 11.67 Ha) and Commercial of 1.11Ha (Existing: 0.34 Ha) in the planning district contributing 9.92% and 0.43% respectively.

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
PLANNING DISTRICTS - 24 - NONGKSEH(CT)

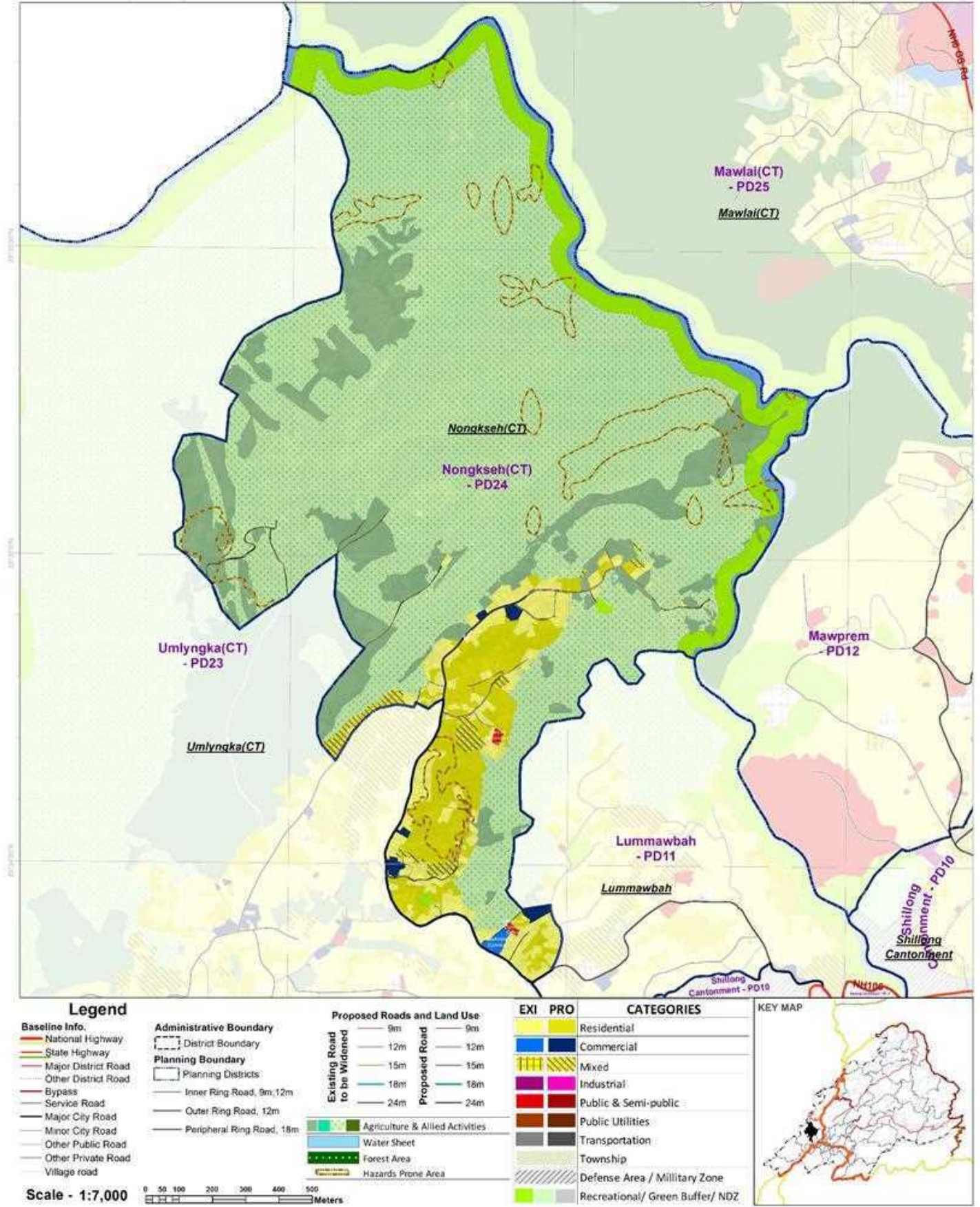


Figure 12-26: Proposed Land Use - PD24 - Nongkseh

### 12.3.25 PLANNING DISTRICT NO.25 – MAWLAI

**Area:** 2546.59Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** NEHU, ISBT, Mawroh Junction, FCI, My Cafe, Abattoir, Banalari Showroom, Mawlai petrol pump, Sacred Heart Theological College, Shillong Polytechnic (Figure 12-27).

Table 12-27: Proposed Landuse-PD25-Mawlai

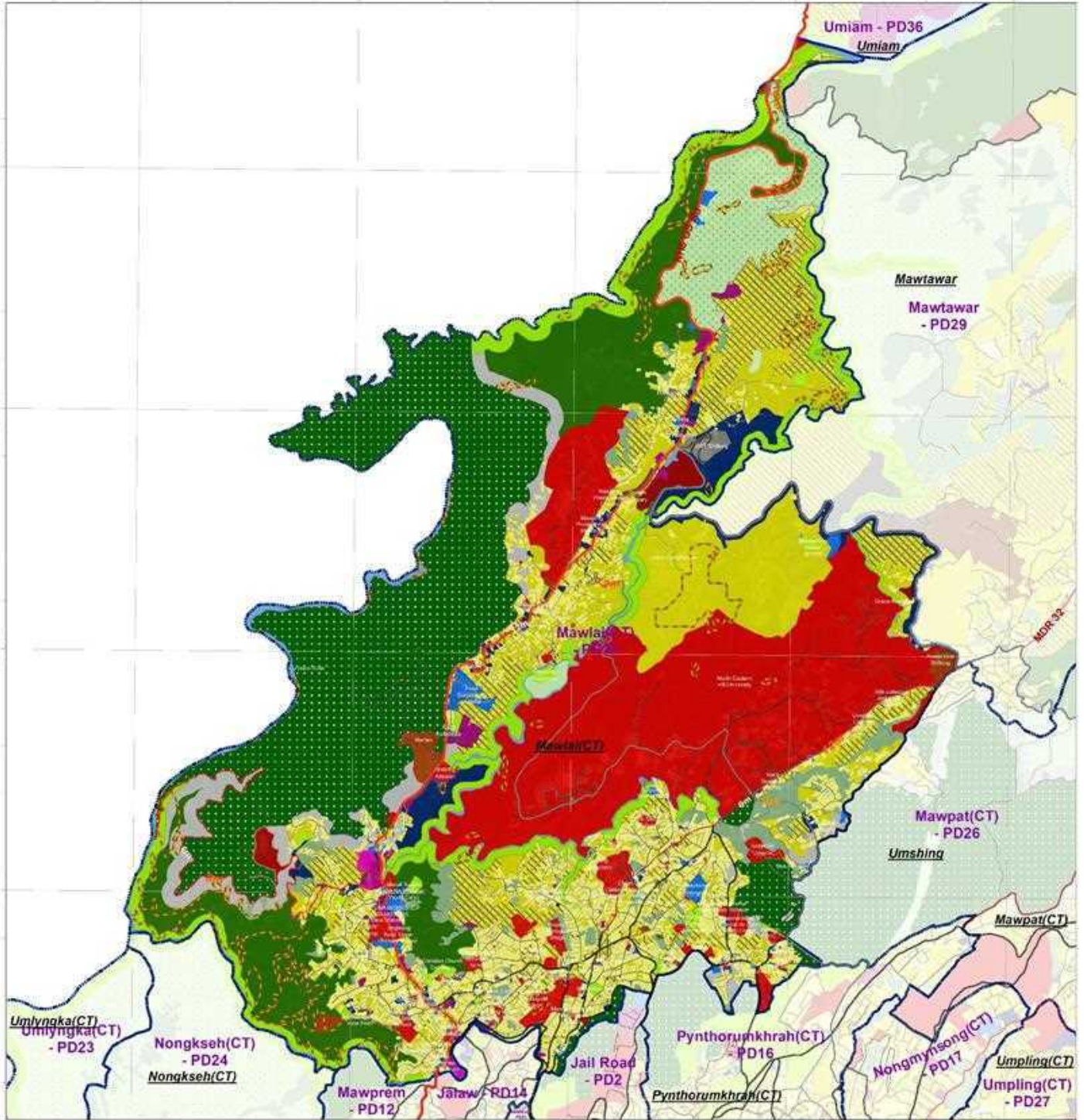
SNo	Categories	Area(Ha)	%age
1	Residential	484.03	19.01
2	Commercial	70.67	2.78
3	Mixed	204.29	8.02
4	Industrial	20.28	0.80
5	Public & Semi public	490.95	19.28
6	Public Utilities	13.62	0.53
7	Transportation	117.99	4.63
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.66	0.03
10	Recreational/ Green Buffer/ NDZ	237.67	9.33
11	Agriculture & Allied Activities	296.85	11.66
12	Water Sheet	42.55	1.67
13	Forest Area	479.63	18.84
14	Hazards Prone Area	87.25	3.43
<b>Grand Total</b>		<b>2546.59</b>	<b>100</b>

#### General Description about the Proposed Land Use in planning district:

The major proposed land uses include residential area of 484.03 Ha (Existing: 246.72 Ha) and Public & Semi-public area of 490.95 Ha (Existing: 477.40 Ha) in the planning district contributing 19.01% and 19.28% respectively (Table 12-27).

However, Forest area contribute maximum at 18.84%. Additionally, area has been proposed for Recreational/ Green Buffer/ NDZ, and for Transportation thus making it to a total of 237.67 Ha and 117.99 Ha respectively. The other proposed land uses are Commercial (70.67 Ha), Mixed use (204.29 Ha) and Industrial (20.28 Ha).

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
PLANNING DISTRICTS - 25 - MAWLAI(CT)

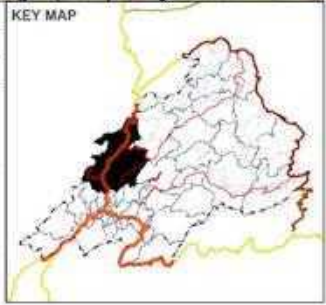


**Legend**

- Baseline Info:**
- National Highway
  - State Highway
  - Major District Road
  - Other District Road
  - Bypass
  - Service Road
  - Major City Road
  - Minor City Road
  - Other Public Road
  - Other Private Road
  - Village road
- Administrative Boundary**
- District Boundary
- Planning Boundary**
- Planning Districts:
  - Inner Ring Road, 9m, 12m
  - Outer Ring Road, 12m
  - Peripheral Ring Road, 18m

- Proposed Roads and Land Use:**
- |                                    |                      |
|------------------------------------|----------------------|
| <b>Existing Road to be Widened</b> | <b>Proposed Road</b> |
| 9m                                 | 9m                   |
| 12m                                | 12m                  |
| 15m                                | 15m                  |
| 18m                                | 18m                  |
| 24m                                | 24m                  |
- Agriculture & Allied Activities
  - Water Sheet
  - Forest Area
  - Hazards Prone Area

EXI	PRO	CATEGORIES
[Yellow]	[Yellow]	Residential
[Blue]	[Blue]	Commercial
[Green]	[Green]	Mixed
[Red]	[Red]	Industrial
[Purple]	[Purple]	Public & Semi-public
[Brown]	[Brown]	Public Utilities
[Grey]	[Grey]	Transportation
[Light Green]	[Light Green]	Township
[Diagonal Lines]	[Diagonal Lines]	Defense Area / Military Zone
[Light Blue]	[Light Blue]	Recreational/ Green Buffer/ NDZ



Scale - 1:20,000 0 250 500 1,000 1,500 Meters

Figure 12-27: Proposed Land Use - PD25 - Mawlai



### 12.3.26 PLANNING DISTRICT NO.26 – MAWPAT

**Area:** 888.35Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** BSF Camp, Mawpat Junction, Ishyrwat junction (*Figure 12-28*).

Table 12-28: Proposed Landuse-PD26-Mawpat

SNo	Categories	Area(Ha)	%age
1	Residential	276.98	31.18
2	Commercial	13.11	1.48
3	Mixed	25.18	2.83
4	Industrial	0.26	0.03
5	Public & Semi0public	51.91	5.84
6	Public Utilities	0.00	0.00
7	Transportation	26.52	2.98
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	53.23	5.99
11	Agriculture & Allied Activities	150.30	16.92
12	Water Sheet	0.97	0.11
13	Forest Area	251.75	28.34
14	Hazards Prone Area	38.12	4.29
<b>Grand Total</b>		<b>888.35</b>	<b>100</b>

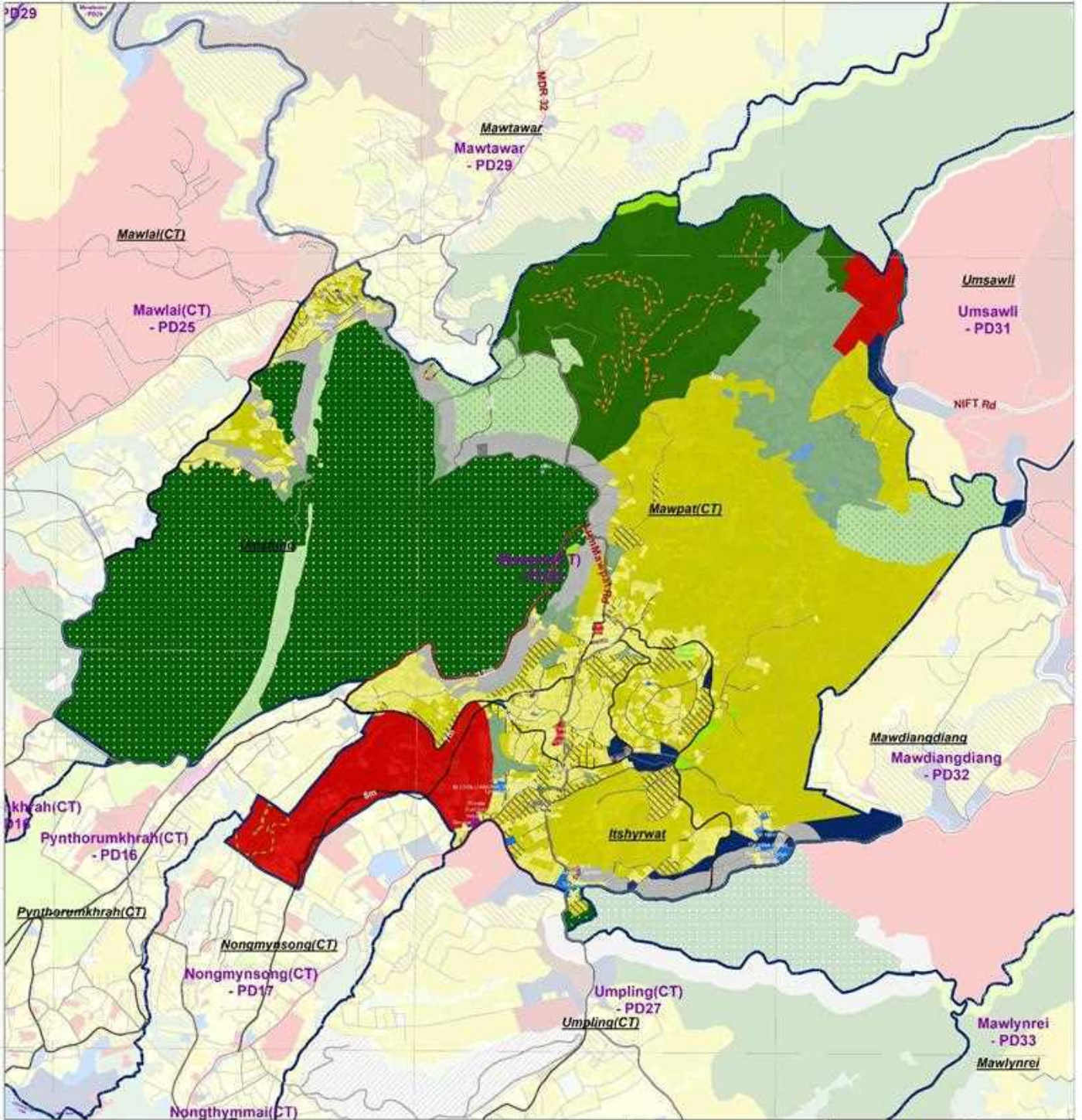
#### General Description about the Proposed Land Use in planning district:

The main land use categories in Mawpat are residential and forest area, which covers 31.18% and 28.34% respectively of the total area (*Table 12-28*).

The major proposed land uses include residential area of 276.98 Ha (Existing: 61.06 Ha) and Recreational/ Green Buffer/ NDZ of 53.23 Ha (Existing: 40.78 Ha) in the planning district contributing 31.18% and 5.99% respectively.

However, Agriculture & Allied Activities contribute maximum at 16.92%. Additionally, an area has been proposed for mixed use and for commercial, thus making it to a total of 25.18 Ha and 13.11 Ha respectively.

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
PLANNING DISTRICTS - 26 - MAWPAT(CT)



**Legend**

- Baseline Info:**
- National Highway
  - State Highway
  - Major District Road
  - Other District Road
  - Bypass
  - Service Road
  - Major City Road
  - Minor City Road
  - Other Public Road
  - Other Private Road
  - Village road

- Administrative Boundary**
- District Boundary
- Planning Boundary**
- Planning Districts:
  - Inner Ring Road, 9m, 12m
  - Outer Ring Road, 12m
  - Peripheral Ring Road, 18m

- Proposed Roads and Land Use:**
- |                             |               |
|-----------------------------|---------------|
| Existing Road to be Widened | Proposed Road |
| 9m                          | 9m            |
| 12m                         | 12m           |
| 15m                         | 15m           |
| 18m                         | 18m           |
| 24m                         | 24m           |
- Agriculture & Allied Activities
  - Water Sheet
  - Forest Area
  - Hazards Prone Area

EXI	PRO	CATEGORIES
[Yellow]	[Yellow]	Residential
[Blue]	[Blue]	Commercial
[Orange]	[Orange]	Mixed
[Purple]	[Purple]	Industrial
[Red]	[Red]	Public & Semi-public
[Brown]	[Brown]	Public Utilities
[Grey]	[Grey]	Transportation
[Light Green]	[Light Green]	Township
[Hatched]	[Hatched]	Defense Area / Military Zone
[Light Green with dots]	[Light Green with dots]	Recreational/ Green Buffer/ NDZ



Scale - 1:12,000

Figure 12-28: Proposed Land Use - PD26 - Mawpat



### 12.3.27 PLANNING DISTRICT NO.27 – UMPLING

**Area:** 444.82 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** Research & Development Establishment, Windermere Resort (Figure 12-29).

Table 12-29: Proposed Landuse-PD27-Umpling

SNo	Categories	Area(Ha)	%age
1	Residential	195.93	44.05
2	Commercial	10.87	2.44
3	Mixed	25.38	5.71
4	Industrial	0.91	0.20
5	Public & Semi public	14.38	3.23
6	Public Utilities	3.00	0.68
7	Transportation	23.17	5.21
8	Township	0.00	0.00
9	Defense Area / Military Zone	36.14	8.13
10	Recreational/ Green Buffer/ NDZ	32.21	7.24
11	Agriculture & Allied Activities	95.29	21.42
12	Water Sheet	0.88	0.20
13	Forest Area	0.00	0.00
14	Hazards Prone Area	6.63	1.49
<b>Grand Total</b>		<b>444.82</b>	<b>100</b>

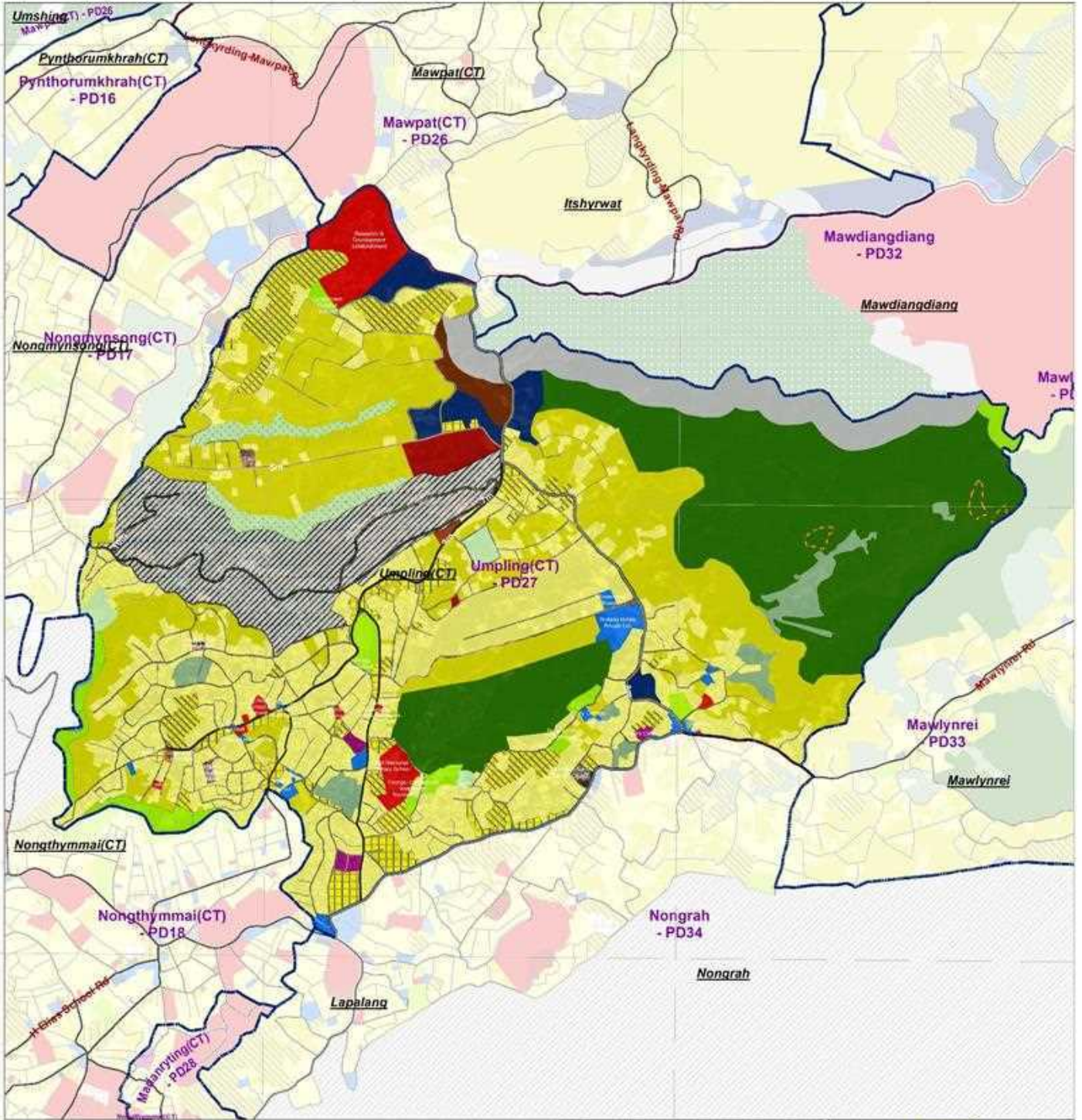
#### General Description about the Proposed Land Use in planning district:

The major proposed land uses include residential area of 195.93 Ha (Existing-102.73 Ha) and Recreational/ Green Buffer/ NDZ of 32.21 Ha (Existing: 25.89 Ha) in the planning district contributing 44.05% and 7.24% respectively (Table 12-29).

However, Agriculture & Allied Activities contribute maximum at 21.42%. Additionally, an area has been proposed for Public & Semi-Public and for Mixed use, thus making it to a total of 14.38 Ha and 25.38 Ha respectively. The other proposed Land uses are commercial (10.87 Ha) and Public utilities (3.00 Ha).



FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 27 - UMPLING(CT)**



**Legend**

<p><b>Baseline Info:</b></p> <ul style="list-style-type: none"> <li><span style="color: red;">—</span> National Highway</li> <li><span style="color: orange;">—</span> State Highway</li> <li><span style="color: brown;">—</span> Major District Road</li> <li><span style="color: grey;">—</span> Other District Road</li> <li><span style="color: black;">—</span> Bypass</li> <li><span style="color: blue;">—</span> Service Road</li> <li><span style="color: black;">—</span> Major City Road</li> <li><span style="color: black;">—</span> Minor City Road</li> <li><span style="color: black;">—</span> Other Public Road</li> <li><span style="color: black;">—</span> Other Private Road</li> <li><span style="color: black;">—</span> Village road</li> </ul>	<p><b>Administrative Boundary</b></p> <ul style="list-style-type: none"> <li><span style="border: 1px dashed black; display: inline-block; width: 10px; height: 10px;"></span> District Boundary</li> <li><span style="border: 1px solid black; display: inline-block; width: 10px; height: 10px;"></span> Planning Districts:</li> <li><span style="border-bottom: 1px solid black; width: 20px; display: inline-block;"></span> Inner Ring Road, 9m, 12m</li> <li><span style="border-bottom: 1px solid black; width: 20px; display: inline-block;"></span> Outer Ring Road, 12m</li> <li><span style="border-bottom: 1px solid black; width: 20px; display: inline-block;"></span> Peripheral Ring Road, 18m</li> </ul>	<p><b>Proposed Roads and Land Use:</b></p> <table border="0"> <tr> <td><span style="border-bottom: 1px solid black; width: 20px; display: inline-block;"></span> Existing Road to be Widened</td> <td><span style="border-bottom: 1px solid black; width: 20px; display: inline-block;"></span> 9m</td> <td><span style="border-bottom: 1px solid black; width: 20px; display: inline-block;"></span> Proposed Road</td> <td><span style="border-bottom: 1px solid black; width: 20px; display: inline-block;"></span> 9m</td> </tr> <tr> <td><span style="border-bottom: 1px solid black; width: 20px; display: inline-block;"></span></td> <td>12m</td> <td><span style="border-bottom: 1px solid black; width: 20px; display: inline-block;"></span></td> <td>12m</td> </tr> <tr> <td><span style="border-bottom: 1px solid black; width: 20px; display: inline-block;"></span></td> <td>15m</td> <td><span style="border-bottom: 1px solid black; width: 20px; display: inline-block;"></span></td> <td>15m</td> </tr> <tr> <td><span style="border-bottom: 1px solid black; width: 20px; display: inline-block;"></span></td> <td>18m</td> <td><span style="border-bottom: 1px solid black; width: 20px; display: inline-block;"></span></td> <td>18m</td> </tr> <tr> <td><span style="border-bottom: 1px solid black; width: 20px; display: inline-block;"></span></td> <td>24m</td> <td><span style="border-bottom: 1px solid black; width: 20px; display: inline-block;"></span></td> <td>24m</td> </tr> </table>	<span style="border-bottom: 1px solid black; width: 20px; display: inline-block;"></span> Existing Road to be Widened	<span style="border-bottom: 1px solid black; 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border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span></td> <td>Agriculture &amp; Allied Activities</td> <td><span style="background-color: #FFFF00; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span></td> <td>Residential</td> </tr> <tr> <td><span style="background-color: #ADD8E6; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span></td> <td>Water Sheet</td> <td><span style="background-color: #FFD700; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span></td> <td>Commercial</td> </tr> <tr> <td><span style="background-color: #3CB371; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span></td> <td>Forest Area</td> <td><span style="background-color: #FFA500; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span></td> <td>Mixed</td> </tr> <tr> <td><span style="background-color: #FF69B4; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span></td> <td>Hazards Prone Area</td> <td><span style="background-color: #FF0000; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span></td> <td>Industrial</td> </tr> <tr> <td><span style="background-color: #800000; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span></td> <td></td> <td><span style="background-color: #800080; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span></td> <td>Public &amp; Semi-public</td> </tr> <tr> <td><span style="background-color: #808080; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span></td> <td></td> <td><span style="background-color: #800000; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span></td> <td>Public Utilities</td> </tr> <tr> <td><span style="background-color: #808080; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span></td> <td></td> <td><span style="background-color: #808080; 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border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span>	Agriculture & Allied Activities	<span style="background-color: #FFFF00; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span>	Residential	<span style="background-color: #ADD8E6; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span>	Water Sheet	<span style="background-color: #FFD700; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span>	Commercial	<span style="background-color: #3CB371; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span>	Forest Area	<span style="background-color: #FFA500; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span>	Mixed	<span style="background-color: #FF69B4; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span>	Hazards Prone Area	<span style="background-color: #FF0000; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span>	Industrial	<span style="background-color: #800000; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span>		<span style="background-color: #800080; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span>	Public & Semi-public	<span style="background-color: #808080; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span>		<span style="background-color: #800000; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span>	Public Utilities	<span style="background-color: #808080; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span>		<span style="background-color: #808080; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span>	Transportation	<span style="background-color: #808080; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span>		<span style="background-color: #808080; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span>	Township	<span style="background-color: #808080; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span>		<span style="background-color: #808080; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span>	Defense Area / Military Zone	<span style="background-color: #90EE90; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span>		<span style="background-color: #90EE90; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span>	Recreational/ Green Buffer/ NDZ	<p><b>KEY MAP</b></p>
<span style="border-bottom: 1px solid black; width: 20px; display: inline-block;"></span> Existing Road to be Widened	<span style="border-bottom: 1px solid black; width: 20px; display: inline-block;"></span> 9m	<span style="border-bottom: 1px solid black; width: 20px; display: inline-block;"></span> Proposed Road	<span style="border-bottom: 1px solid black; width: 20px; display: inline-block;"></span> 9m																																																													
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<span style="background-color: #90EE90; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span>	Agriculture & Allied Activities	<span style="background-color: #FFFF00; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span>	Residential																																																													
<span style="background-color: #ADD8E6; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span>	Water Sheet	<span style="background-color: #FFD700; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span>	Commercial																																																													
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<span style="background-color: #FF69B4; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span>	Hazards Prone Area	<span style="background-color: #FF0000; border: 1px solid black; width: 15px; height: 10px; display: inline-block;"></span>	Industrial																																																													
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**Scale - 1:8,900**

0 50 100 200 300 400 500 Meters

Figure 12-29: Proposed Land Use - PD27 - Umpling



### 12.3.28 PLANNING DISTRICT NO.28 –MADANRYTING

**Area:** 190.84 Hectares

**Location:** Peri-Urban Area

**Major Landmarks:** ITI, GSI, Ministry of Environment, Forest and Climate Change, Supercare Hospital, Rani Motors (Figure 12-30).

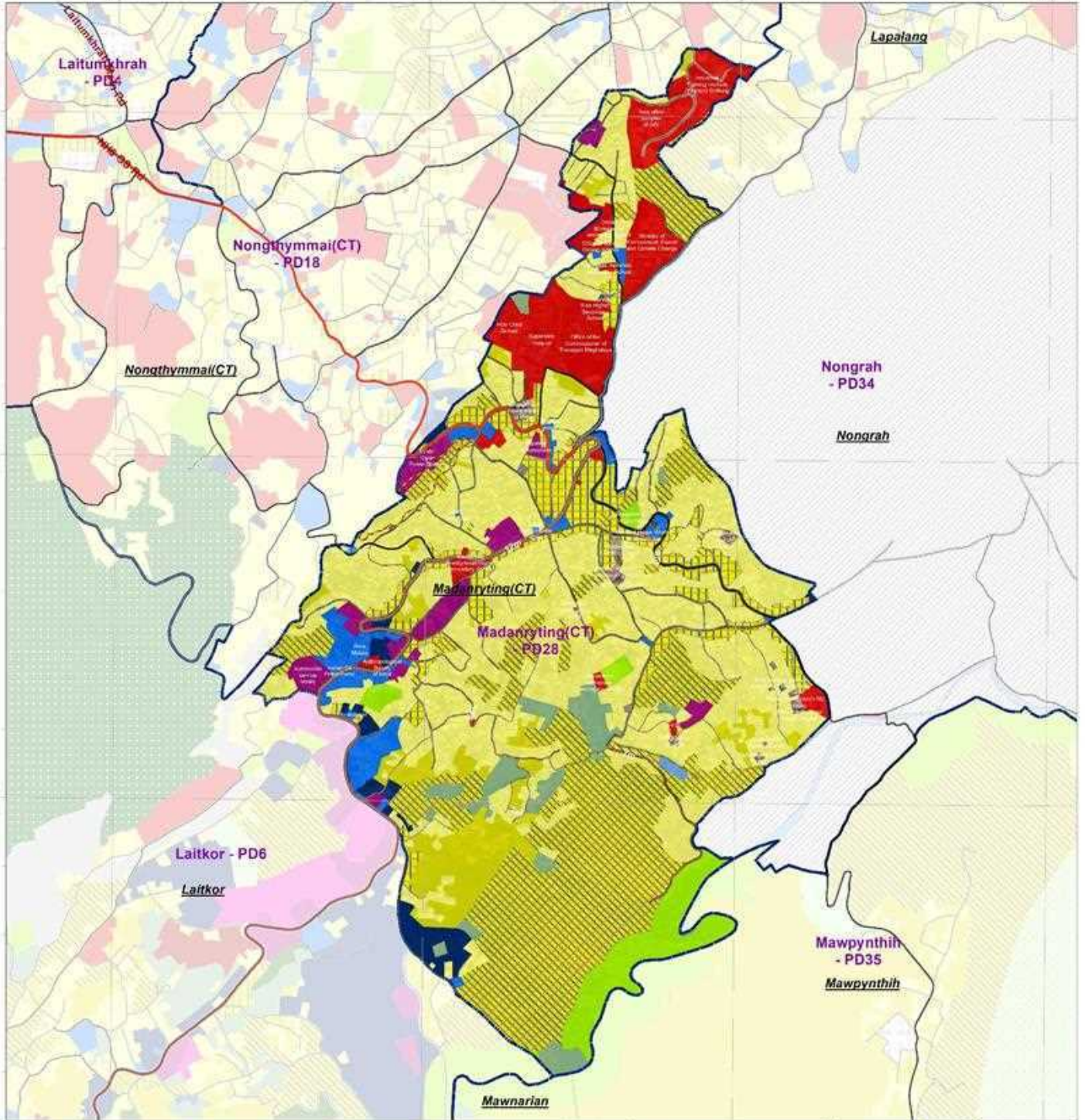
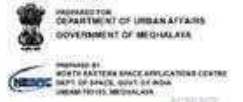
Table 12-30: Proposed Landuse-PD28-Madanrynting

SNo	Categories	Area(Ha)	%age
1	Residential	79.61	41.71
2	Commercial	8.43	4.42
3	Mixed	55.39	29.02
4	Industrial	4.93	2.58
5	Public & Semi public	16.71	8.76
6	Public Utilities	0.00	0.00
7	Transportation	12.16	6.37
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.02	0.01
10	Recreational/ Green Buffer/ NDZ	7.47	3.91
11	Agriculture & Allied Activities	5.43	2.84
12	Water Sheet	0.69	0.36
13	Forest Area	0.00	0.00
14	Hazards Prone Area	0.00	0.00
<b>Grand Total</b>		<b>190.84</b>	<b>100</b>

**General Description about the Proposed Land Use in planning district:**

The major proposed land uses include residential area of 79.61 Ha (Existing: 69.14 Ha) and mixed use area of 55.39 Ha (Existing: 12.06 Ha) in the planning district contributing 41.71% and 29.02% respectively. Additionally, an area of 1.44 Ha has been proposed for Commercial, thus making it to a total of 8.43 Ha, representing 4.42% of the total area (Table 12-30).

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
PLANNING DISTRICTS - 28 - MADANRYTING(CT)



**Legend**

- Baseline Info:**
- National Highway
  - State Highway
  - Major District Road
  - Other District Road
  - Bypass
  - Service Road
  - Major City Road
  - Minor City Road
  - Other Public Road
  - Other Private Road
  - Village road
- Administrative Boundary**
- District Boundary
- Planning Boundary**
- Planning Districts:
  - Inner Ring Road, 9m, 12m
  - Outer Ring Road, 12m
  - Peripheral Ring Road, 18m

- Proposed Roads and Land Use:**
- |                                    |     |     |
|------------------------------------|-----|-----|
| <b>Existing Road to be Widened</b> | 9m  | 9m  |
|                                    | 12m | 12m |
|                                    | 15m | 15m |
|                                    | 18m | 18m |
|                                    | 24m | 24m |

- Agriculture & Allied Activities
- Water Sheet
- Forest Area
- Hazards Prone Area

EXI	PRO	CATEGORIES
[Yellow]	[Yellow]	Residential
[Blue]	[Blue]	Commercial
[Green]	[Green]	Mixed
[Red]	[Red]	Industrial
[Purple]	[Purple]	Public & Semi-public
[Brown]	[Brown]	Public Utilities
[Grey]	[Grey]	Transportation
[Light Green]	[Light Green]	Township
[Hatched]	[Hatched]	Defense Area / Military Zone
[Light Blue]	[Light Blue]	Recreational/ Green Buffer/ NDZ



Scale - 1:7,000

Figure 12-30: Proposed Land Use - PD28 - Madanryting



### 12.3.29 PLANNING DISTRICT NO.29 – MAWTAWAR

**Area:** 1666.72 Hectares

**Location:** Peripheral Area

**Major Landmarks:** Mawtawar Block Development Office, Bypass Junction, Mawtawar Presbyterian Church, Umsaw Mawjynrong Community Hall (*Figure 12-31*).

Table 12-31: Proposed Landuse-PD29-Madwtawar

SNo	Categories	Area(Ha)	age
1	Residential	458.81	27.53
2	Commercial	14.91	0.89
3	Mixed	217.47	13.05
4	Industrial	0.18	0.01
5	Public & Semi public	7.47	0.45
6	Public Utilities	39.65	2.38
7	Transportation	61.72	3.70
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	89.58	5.37
11	Agriculture & Allied Activities	516.68	31.00
12	Water Sheet	18.13	1.09
13	Forest Area	0.00	0.00
14	Hazards Prone Area	242.10	14.53
<b>Grand Total</b>		<b>1666.72</b>	<b>100</b>

**General Description about the Proposed Land Use in planning district:**

The major proposed land uses include agriculture & allied activities of 516.68 Ha (Existing: 227.18 Ha) and Residential area of 458.81 Ha (Existing: 48.27 Ha) in the planning district contributing 31% and 27.53% respectively (*Table 12-31*).

Additionally, an area has been proposed for Transportation and for commercial area, thus making it to a total of 61.72Ha and 14.91Ha respectively.

The other proposed land uses are Public utilities (39.65 Ha), Public & semi-public (7.47 Ha), Mixed use (217.47 Ha) and Industrial area (0.81 Ha).



### 12.3.30 PLANNING DISTRICT NO.30 –NONGKHLEW

**Area:** 1303.26 Hectares

**Location:** Peripheral Area

**Major Landmarks:** Madan Nongkohlew Playground, Samuel Christian School, Don Bosco Nongkohlew Secondary School, Samuel Christian School (*Figure 12-32*).

**Table 12-32: Proposed Landuse-PD30-Nongkohlew**

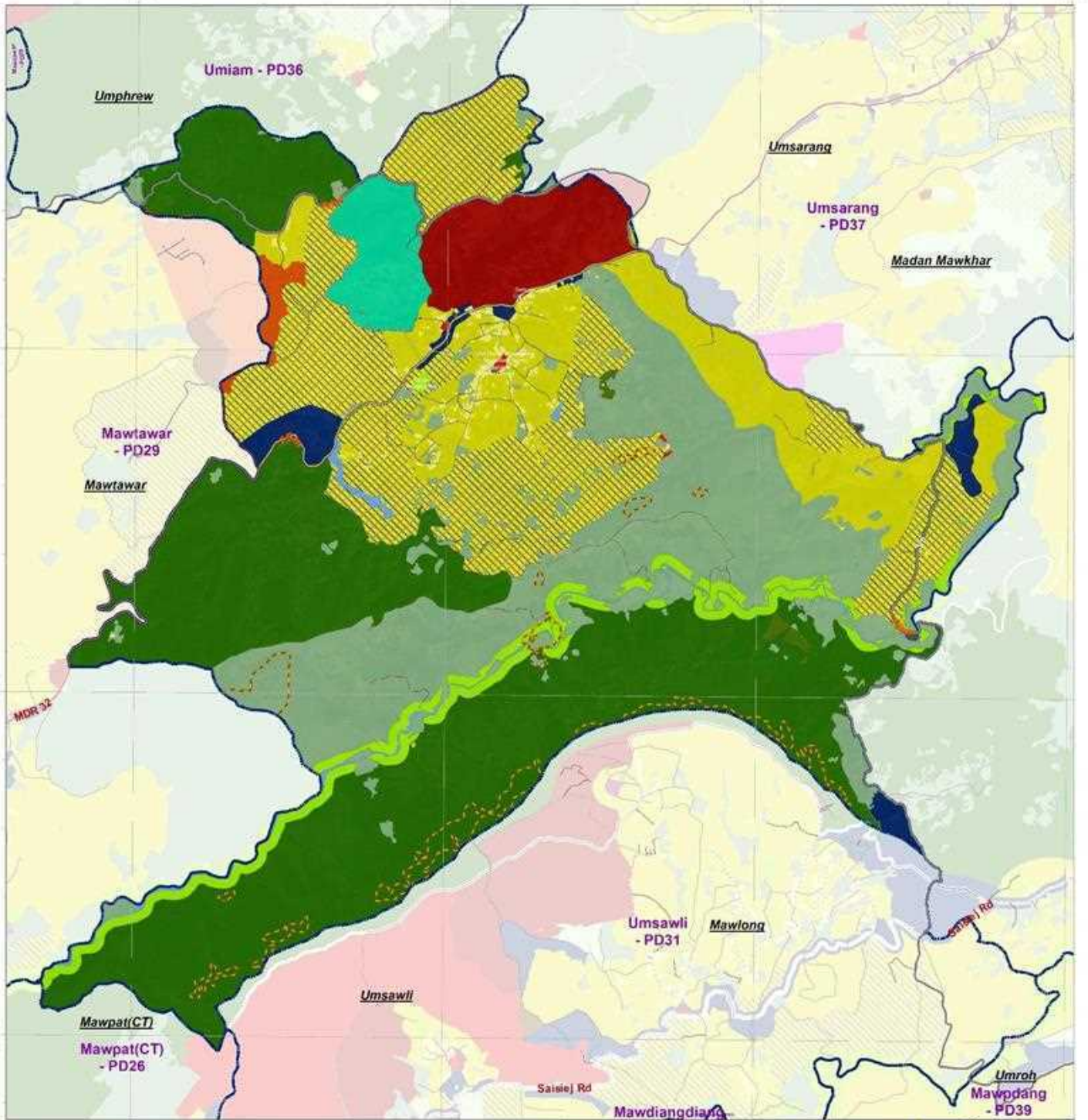
SNo	Categories	Area(Ha)	age
1	Residential	130.72	10.18
2	Commercial	19.98	1.56
3	Mixed	212.18	16.53
4	Industrial	0.00	0.00
5	Public & Semi public	54.85	4.27
6	Public Utilities	0.00	0.00
7	Transportation	28.22	2.20
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	48.24	3.76
11	Agriculture & Allied Activities	778.65	60.65
12	Water Sheet	11.02	0.86
13	Forest Area	0.00	0.00
14	Hazards Prone Area	0.00	0.00
<b>Grand Total</b>		<b>1303.26</b>	<b>100</b>

#### **General Description about the Proposed Land Use in planning district:**

The main land use categories in Nongkohlew include Agriculture & Allied Activities of 778.65 Ha (Existing: 285.22 Ha) and Residential area of 130.72 Ha (Existing: 8.71 Ha) in the planning district contributing 60.65% and 10.18% respectively (*Table 12-32*).

However, mixed contribute maximum at 212.18 Ha. Additionally, area has been proposed for Public & Semi-Public thus making it to a total of 54.85 Ha of the total area.

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
PLANNING DISTRICTS - 30 - NONGKOHLEW



**Legend**

- Baseline Info:**
- National Highway
  - State Highway
  - Major District Road
  - Other District Road
  - Bypass
  - Service Road
  - Major City Road
  - Minor City Road
  - Other Public Road
  - Other Private Road
  - Village road
- Administrative Boundary**
- District Boundary
- Planning Boundary**
- Planning Districts:
  - Inner Ring Road, 9m, 12m
  - Outer Ring Road, 12m
  - Peripheral Ring Road, 18m

- Proposed Roads and Land Use:**
- | Existing Road to be Widened | Proposed Road |
|-----------------------------|---------------|
| 9m                          | 9m            |
| 12m                         | 12m           |
| 15m                         | 15m           |
| 18m                         | 18m           |
| 24m                         | 24m           |
- Agriculture & Allied Activities
  - Water Sheet
  - Forest Area
  - Hazards Prone Area

EXI	PRO	CATEGORIES
[Yellow]	[Yellow]	Residential
[Blue]	[Blue]	Commercial
[Green]	[Green]	Mixed
[Red]	[Red]	Industrial
[Orange]	[Orange]	Public & Semi-public
[Brown]	[Brown]	Public Utilities
[Grey]	[Grey]	Transportation
[Light Blue]	[Light Blue]	Township
[Dark Blue]	[Dark Blue]	Defense Area / Military Zone
[Light Green]	[Light Green]	Recreational/ Green Buffer/ NDZ



Scale - 1:14,000 0 100 200 400 600 800 1,000 Meters

Figure 12-32: Proposed Land Use - PD30 - Nongkohlew

### 12.3.31 PLANNING DISTRICT NO.31 –UMSAWLI

**Area:** 733.72Hectares

**Location:** Peripheral Area

**Major Landmarks:** IIM Shillong, NIFT, TB Hospital (*Figure 12-33*).

Table 12-33: Proposed Landuse-PD31-Umsawli

SNo	Categories	Area(Ha)	%age
1	Residential	237.77	32.41
2	Commercial	44.07	6.01
3	Mixed	62.97	8.58
4	Industrial	0.59	0.08
5	Public & Semi public	232.52	31.69
6	Public Utilities	4.28	0.58
7	Transportation	43.32	5.90
8	Township	0.56	0.08
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	33.42	4.55
11	Agriculture & Allied Activities	70.62	9.62
12	Water Sheet	3.18	0.43
13	Forest Area	0.00	0.00
14	Hazards Prone Area	0.39	0.05
<b>Grand Total</b>		<b>733.72</b>	<b>100</b>

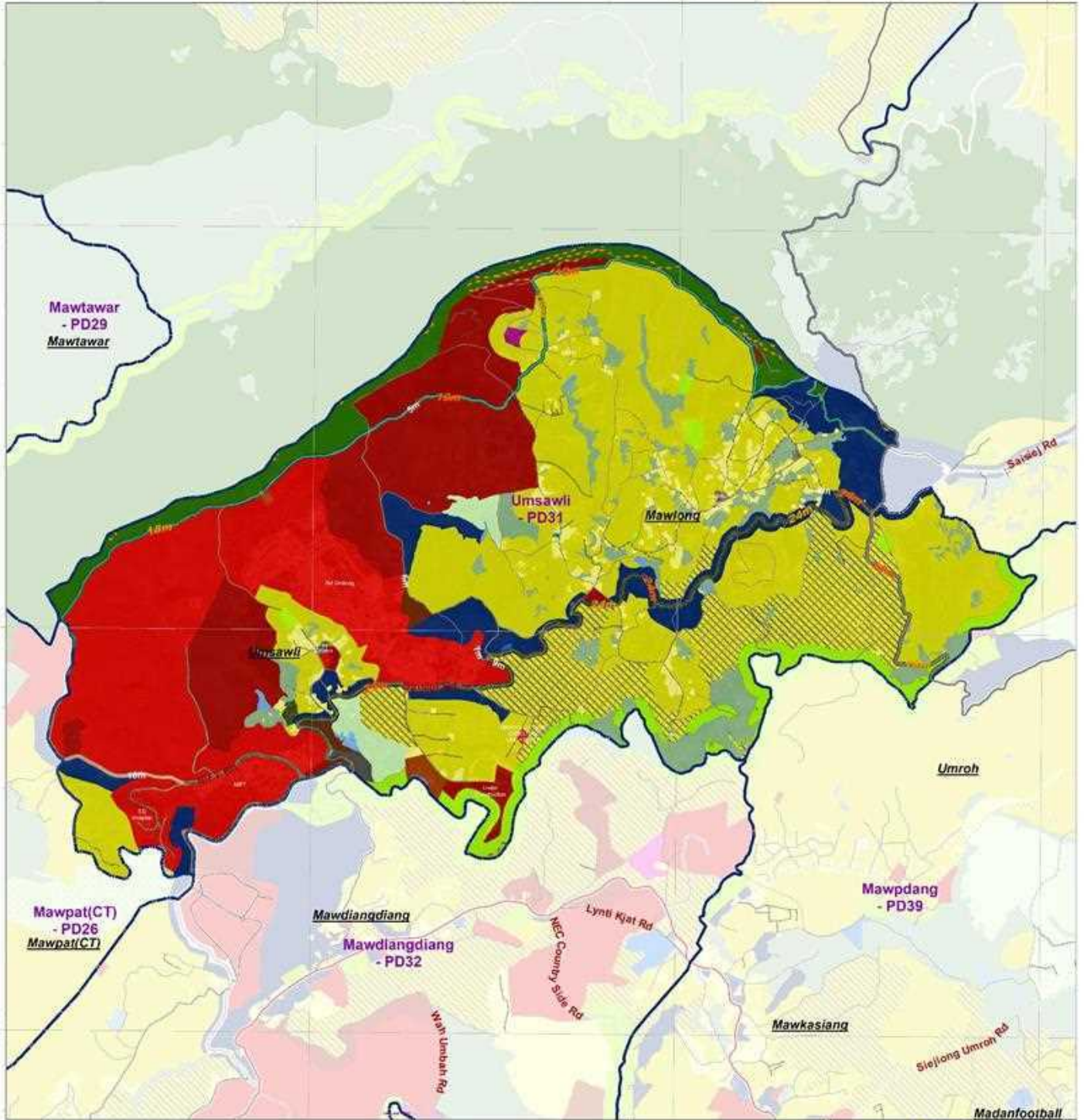
#### General Description about the Proposed Land use in planning district:

The major proposed land uses include Public & Semi-public of 232.52Ha (Existing: 139.13Ha) and residential area of 237.77Ha (Existing: 18.46Ha) in the planning district contributing 31.69% and 32.41% respectively (*Table 12-33*).

Additionally, area has been proposed for Commercial and for Transportation, thus making it to a total of 44.07Ha and 43.32Ha, respectively. The other proposed Land uses are Recreational/ Green Buffer/ NDZ (33.42 Ha), Mixed use (62.97 Ha) and Public utilities (4.28Ha).



FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 31 - UMSAWLI**



**Legend**

- Baseline Info:**
- National Highway
  - State Highway
  - Major District Road
  - Other District Road
  - Bypass
  - Service Road
  - Major City Road
  - Minor City Road
  - Other Public Road
  - Other Private Road
  - Village road
- Administrative Boundary**
- District Boundary
- Planning Boundary**
- Planning Districts:
  - Inner Ring Road, 9m, 12m
  - Outer Ring Road, 12m
  - Peripheral Ring Road, 18m

- Proposed Roads and Land Use:**
- |                             |               |
|-----------------------------|---------------|
| Existing Road to be Widened | Proposed Road |
| 9m                          | 9m            |
| 12m                         | 12m           |
| 15m                         | 15m           |
| 18m                         | 18m           |
| 24m                         | 24m           |
- Agriculture & Allied Activities
  - Water Sheet
  - Forest Area
  - Hazards Prone Area

EXI	PRO	CATEGORIES
[Yellow]	[Yellow]	Residential
[Blue]	[Blue]	Commercial
[Green]	[Green]	Mixed
[Purple]	[Purple]	Industrial
[Red]	[Red]	Public & Semi-public
[Brown]	[Brown]	Public Utilities
[Grey]	[Grey]	Transportation
[Light Blue]	[Light Blue]	Township
[Hatched]	[Hatched]	Defense Area / Military Zone
[Light Green]	[Light Green]	Recreational / Green Buffer / NDZ



Scale - 1:12,000 0 100 200 400 600 800 Meters

Figure 12-33: Proposed Land Use - PD31 - Umsawli



### 12.3.32 PLANNING DISTRICT NO.32 –MAWDIANGDIANG

**Area:** 627.03Hectares

**Location:** Peripheral Area

**Major Landmarks:** NEIGRIHMS, Legislative Assembly Building, IJHM, Juvenile Home (Figure 12-34).

Table 12-34: Proposed Landuse-PD32-Mawdiangdiang

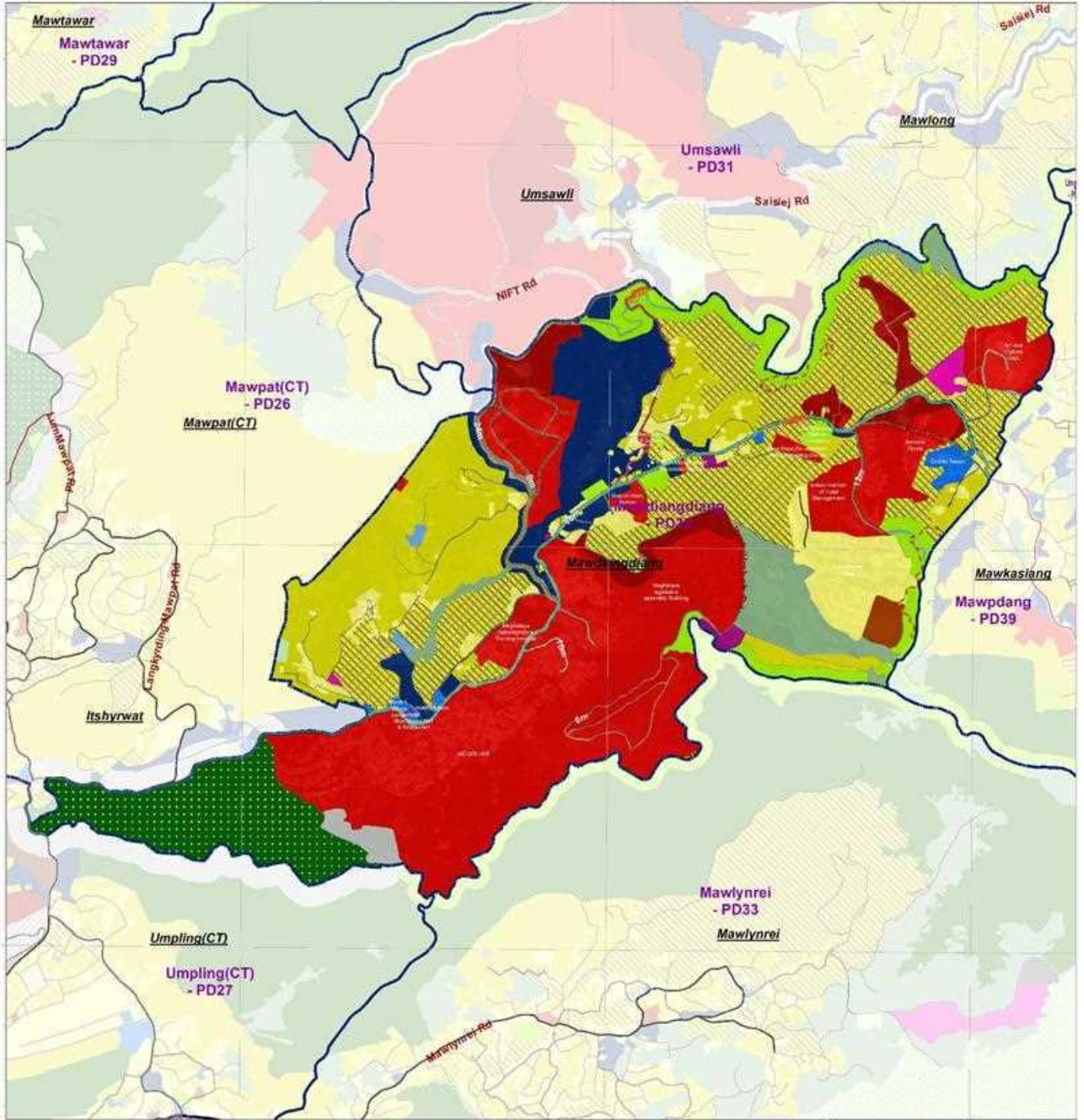
SNo	Categories	Area(Ha)	%age
1	Residential	109.56	17.48
2	Commercial	43.49	6.94
3	Mixed	110.86	17.69
4	Industrial	4.30	0.69
5	Public & Semi public	218.33	34.84
6	Public Utilities	3.33	0.53
7	Transportation	28.51	4.55
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	34.57	5.52
11	Agriculture & Allied Activities	25.38	4.05
12	Water Sheet	4.24	0.68
13	Forest Area	44.06	7.03
14	Hazards Prone Area	0.10	0.02
<b>Grand Total</b>		<b>627.03</b>	<b>100</b>

#### General Description about the Proposed Land use in planning district:

The major proposed land uses include Public & Semi-public of 218.33Ha (Existing: 196.79Ha) and residential area of 109.56Ha (Existing: 34.26Ha) in the planning district contributing 34.84% and 17.48% respectively (Table 12-34).

Additionally, area has been proposed for Commercial and for mixed use, thus making it to a total of 43.49Ha and 110.86Ha, respectively. The other proposed land uses are Recreational/ Green Buffer/ NDZ (34.57Ha), Transportation (28.51Ha) and Industrial (4.30 Ha).

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 32 - MAWDIANGDIANG**



**Legend**

- Baseline Info:**
- National Highway
  - State Highway
  - Major District Road
  - Other District Road
  - Bypass
  - Service Road
  - Major City Road
  - Minor City Road
  - Other Public Road
  - Other Private Road
  - Village road
- Administrative Boundary**
- District Boundary
- Planning Boundary**
- Planning Districts:
  - Inner Ring Road, 9m, 12m
  - Outer Ring Road, 12m
  - Peripheral Ring Road, 18m

- Proposed Roads and Land Use:**
- | Existing Road to be Widened | Proposed Road |
|-----------------------------|---------------|
| 9m                          | 9m            |
| 12m                         | 12m           |
| 15m                         | 15m           |
| 18m                         | 18m           |
| 24m                         | 24m           |
- Agriculture & Allied Activities
  - Water Sheet
  - Forest Area
  - Hazards Prone Area

EXI	PRO	CATEGORIES
[Yellow]	[Yellow]	Residential
[Blue]	[Blue]	Commercial
[Green]	[Green]	Mixed
[Red]	[Red]	Industrial
[Purple]	[Purple]	Public & Semi-public
[Brown]	[Brown]	Public Utilities
[Grey]	[Grey]	Transportation
[Light Green]	[Light Green]	Township
[Diagonal Lines]	[Diagonal Lines]	Defense Area / Military Zone
[Light Blue]	[Light Blue]	Recreational/ Green Buffer/ NDZ



Scale - 1:12,000

Figure 12-34: Proposed Land Use - PD32 - Mawdiangdiang



### 12.3.33 PLANNING DISTRICT NO.33 –MAWLYNREI

**Area:** 844.95Hectares

**Location:** Peripheral Area

**Major Landmarks:** Laitlyngkot waterfall, Phudmuri Falls, Mawlynrei Falls, St. Agnes's Secondary School (Figure 12-35).

Table 12-35: Proposed Landuse-PD33-Mawlynrei

SNo	Categories	Area(Ha)	%age
1	Residential	128.48	15.21
2	Commercial	2.94	0.35
3	Mixed	158.87	18.80
4	Industrial	8.18	0.97
5	Public & Semi public	1.76	0.21
6	Public Utilities	0.02	0.00
7	Transportation	20.80	2.46
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	58.48	6.92
11	Agriculture & Allied Activities	307.98	36.45
12	Water Sheet	6.50	0.77
13	Forest Area	0.00	0.00
14	Hazards Prone Area	50.93	5.86
<b>Grand Total</b>		<b>844.95</b>	<b>100</b>

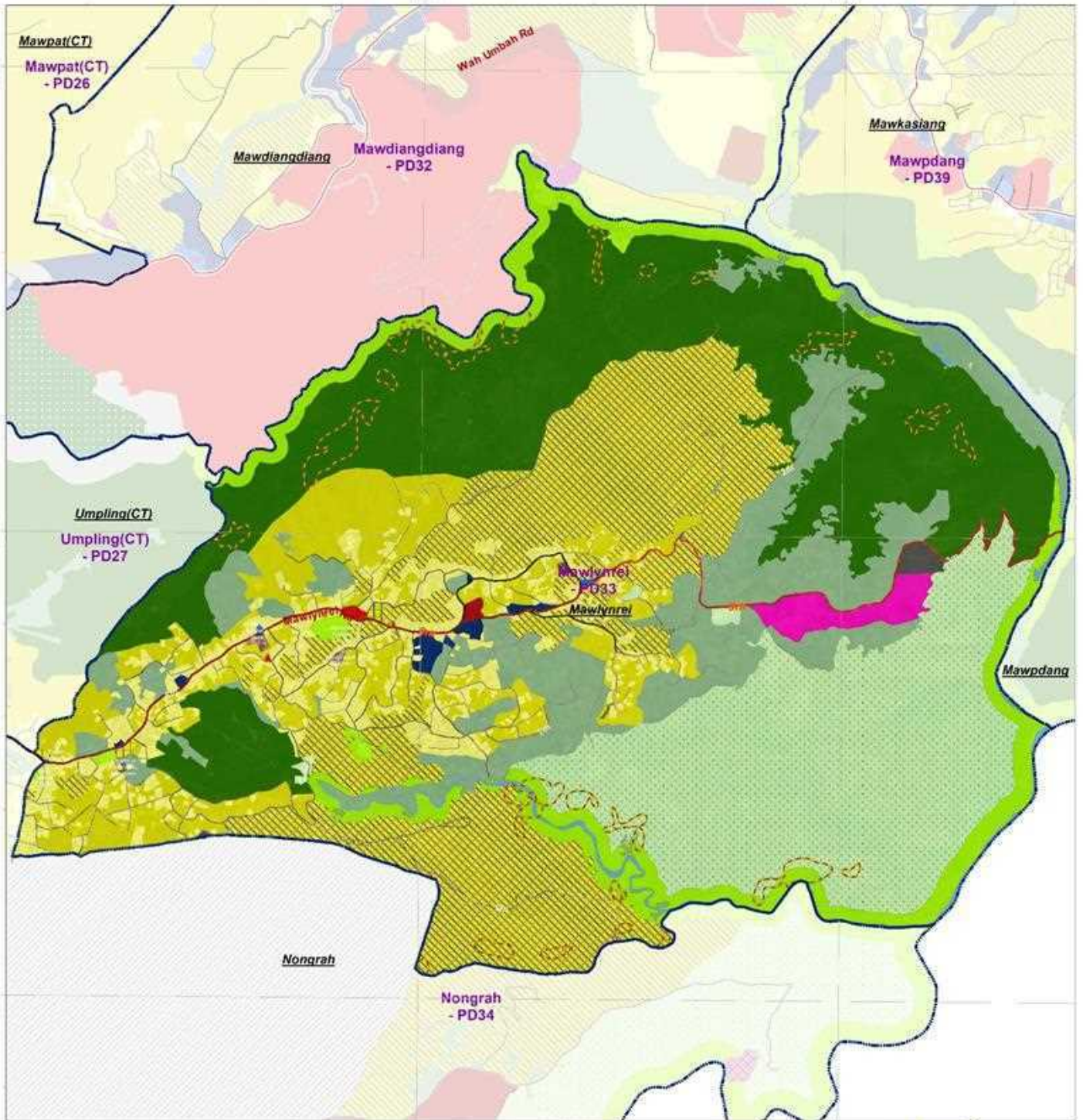
#### General Description about the Proposed Land use in planning district:

The main land use categories in Mawlynrei is agriculture & allied activities, which covers 36.45% of the total area (Table 12-35).

The major proposed Land uses include residential area of 128.48Ha (Existing: 51.44Ha) and Transportation of 20.80Ha (Existing: 18.97Ha) in the planning district contributing to 15.21% and 2.46% respectively.

Additionally, an area of 1.51Ha has been proposed for Recreational/ Green Buffer/ NDZ and 8.18Ha for Industrial area, thus making it to a total of 58.48Ha and 8.18Ha, respectively. The other proposed land uses are mixed use (158.87Ha), Commercial (2.94Ha) and Public & Semi-public (1.76Ha).

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 33 - MAWLYNREI**



**Legend**

**Baseline Info:**  
 National Highway  
 State Highway  
 Major District Road  
 Other District Road  
 Bypass  
 Service Road  
 Major City Road  
 Minor City Road  
 Other Public Road  
 Other Private Road  
 Village road

**Administrative Boundary**  
 District Boundary  
 Planning Districts:  
 Inner Ring Road, 9m, 12m  
 Outer Ring Road, 12m  
 Peripheral Ring Road, 18m

**Proposed Roads and Land Use:**

Existing Road to be Widened	Proposed Road
9m	9m
12m	12m
15m	15m
18m	18m
24m	24m

**Categories:**  
 Agriculture & Allied Activities  
 Water Sheet  
 Forest Area  
 Hazards Prone Area

EXI	PRO	CATEGORIES
[Yellow]	[Yellow]	Residential
[Blue]	[Blue]	Commercial
[Green]	[Green]	Mixed
[Red]	[Red]	Industrial
[Orange]	[Orange]	Public & Semi-public
[Brown]	[Brown]	Public Utilities
[Grey]	[Grey]	Transportation
[Light Green]	[Light Green]	Township
[Dark Green]	[Dark Green]	Defense Area / Military Zone
[Light Blue]	[Light Blue]	Recreational/ Green Buffer/ NDZ

**Scale - 1:10,000**  
 0 100 200 400 600 800 1,000 Meters

**KEY MAP**  
 [Small map showing the location of Mawlynrei within the Shillong Planning Area]

Figure 12-35: Proposed Land Use - PD33 - Mawlynrei



### 12.3.34 PLANNING DISTRICT NO.34 – NONGRAH

**Area:** 1095.52Hectares

**Location:** Peripheral Area

**Major Landmarks:** Power System Operation Corporation Ltd. (NERLDC), Martin Luther Christian University, Sweet Falls View Point (*Figure 12-36*).

Table 12-36: Proposed Landuse-PD34-Nongrah

SNo	Categories	Area(Ha)	%age
1	Residential	141.49	12.92
2	Commercial	3.93	0.36
3	Mixed	184.71	16.86
4	Industrial	0.06	0.01
5	Public & Semi0public	33.10	3.02
6	Public Utilities	0.40	0.04
7	Transportation	20.22	1.85
8	Township	0.00	0.00
9	Defense Area / Military Zone	478.11	43.65
10	Recreational/ Green Buffer/ NDZ	62.03	5.66
11	Agriculture & Allied Activities	101.83	9.30
12	Water Sheet	7.06	0.64
13	Forest Area	0.00	0.00
14	Hazards Prone Area	62.42	5.70
<b>Grand Total</b>		<b>1095.52</b>	<b>100</b>

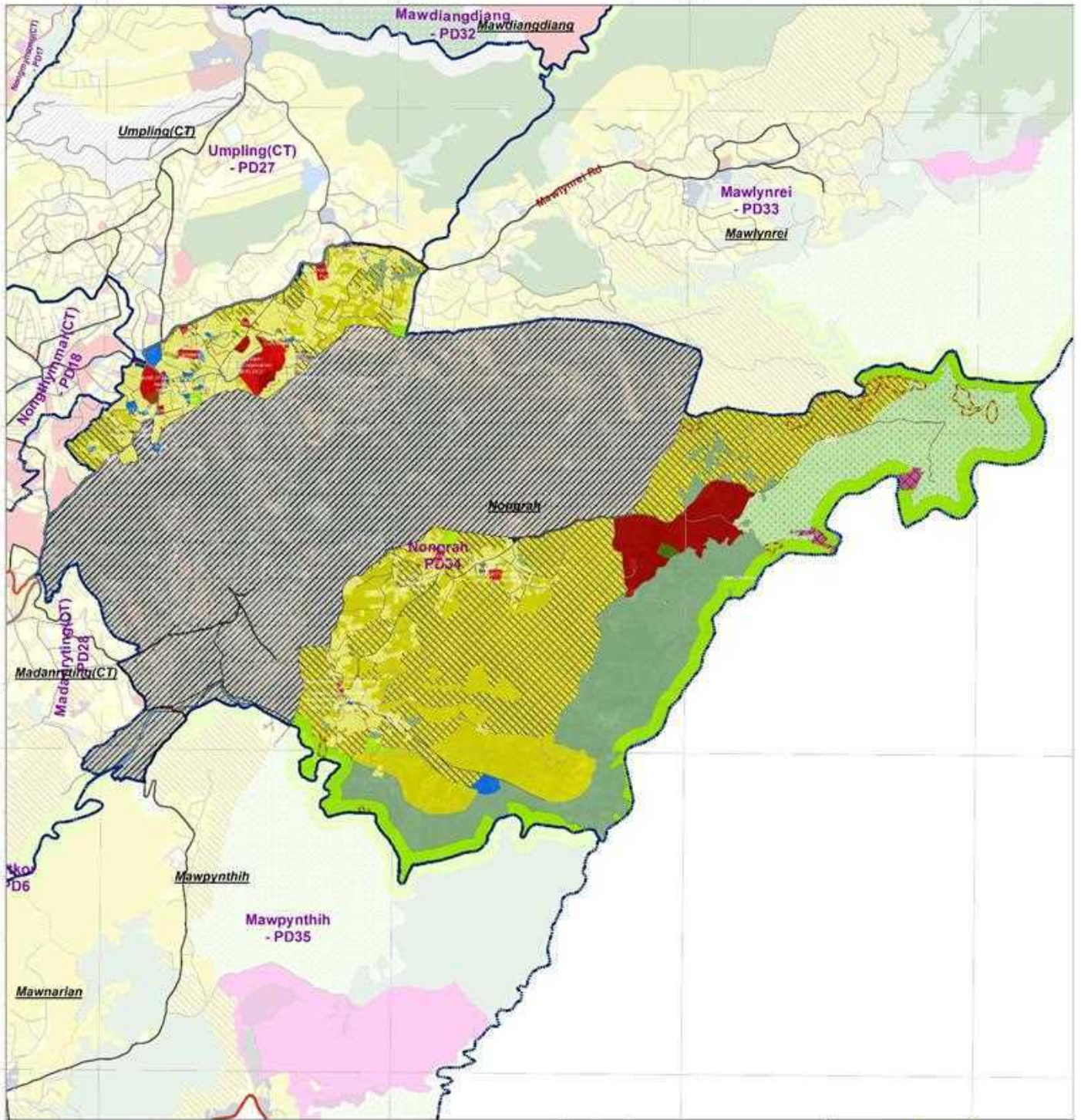
#### General Description about the Proposed Land Use in planning district:

In Nongrah area, the majority of the land is classified as "Unclassified" with 43.65%, followed by agriculture & allied activities at 9.3%. The other land use categories have a relatively smaller percentage area (*Table 12-36*).

The major proposed Land uses include residential area of 141.49 Ha (Existing: 67.46 Ha) and Transportation of 20.22 Ha (Existing: 20.00 Ha) in the planning district contributing to 12.92% and 1.85% respectively.

Additionally, an area of 0.15 Ha has been proposed for Recreational/ Green Buffer/ NDZ and 1.13Ha for Public & Semi-public, thus making it to a total of 62.03Ha and 33.10Ha, respectively. The other proposed land uses are mixed use (184.71Ha) and Commercial (3.93Ha).

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 34 - NONGRAH**

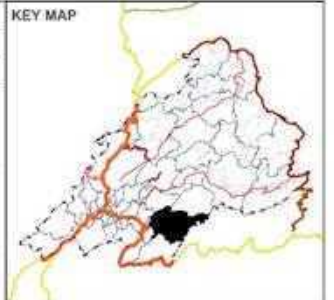


**Legend**

- Baseline Info:**
- National Highway
  - State Highway
  - Major District Road
  - Other District Road
  - Bypass
  - Service Road
  - Major City Road
  - Minor City Road
  - Other Public Road
  - Other Private Road
  - Village road
- Administrative Boundary**
- District Boundary
- Planning Boundary**
- Planning Districts:
  - Inner Ring Road, 9m, 12m
  - Outer Ring Road, 12m
  - Peripheral Ring Road, 18m

- Proposed Roads and Land Use:**
- | Existing Road to be Widened | Proposed Road |
|-----------------------------|---------------|
| 9m                          | 9m            |
| 12m                         | 12m           |
| 15m                         | 15m           |
| 18m                         | 18m           |
| 24m                         | 24m           |
- Agriculture & Allied Activities
  - Water Sheet
  - Forest Area
  - Hazards Prone Area

EXI	PRO	CATEGORIES
[Yellow]	[Yellow]	Residential
[Blue]	[Blue]	Commercial
[Green]	[Green]	Mixed
[Red]	[Red]	Industrial
[Orange]	[Orange]	Public & Semi-public
[Brown]	[Brown]	Public Utilities
[Grey]	[Grey]	Transportation
[Diagonal Lines]	[Diagonal Lines]	Township
[Hatched]	[Hatched]	Defense Area / Military Zone
[Light Green]	[Light Green]	Recreational/ Green Buffer/ NDZ



Scale - 1:15,000 0 100 200 400 600 800 1,000 Meters

Figure 12-36: Proposed Land Use - PD34 - Nongrah

### 12.3.35 PLANNING DISTRICT NO.35 – MAWPYNTHIH

**Area:** 909.82Hectares

**Location:** Peripheral Area

**Major Landmarks:** St Mary Mozzarella Catholic Church, Umphyrnai sub health centre, RLG E-Waste Collection Centre (*Figure 12-37*).

Table 12-37: Proposed Landuse-PD35-Mawpynthih

SNo	Categories	Area(Ha)	%age
1	Residential	242.02	31.23
2	Commercial	6.86	0.89
3	Mixed	104.72	13.51
4	Industrial	80.49	10.39
5	Public & Semi0public	1.87	0.24
6	Public Utilities	0.00	0.00
7	Transportation	14.96	1.93
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	59.38	7.66
11	Agriculture & Allied Activities	118.54	15.30
12	Water Sheet	4.67	0.60
13	Forest Area	0.00	0.00
14	Hazards Prone Area	41.35	6.24
<b>Grand Total</b>		<b>909.82</b>	<b>100</b>

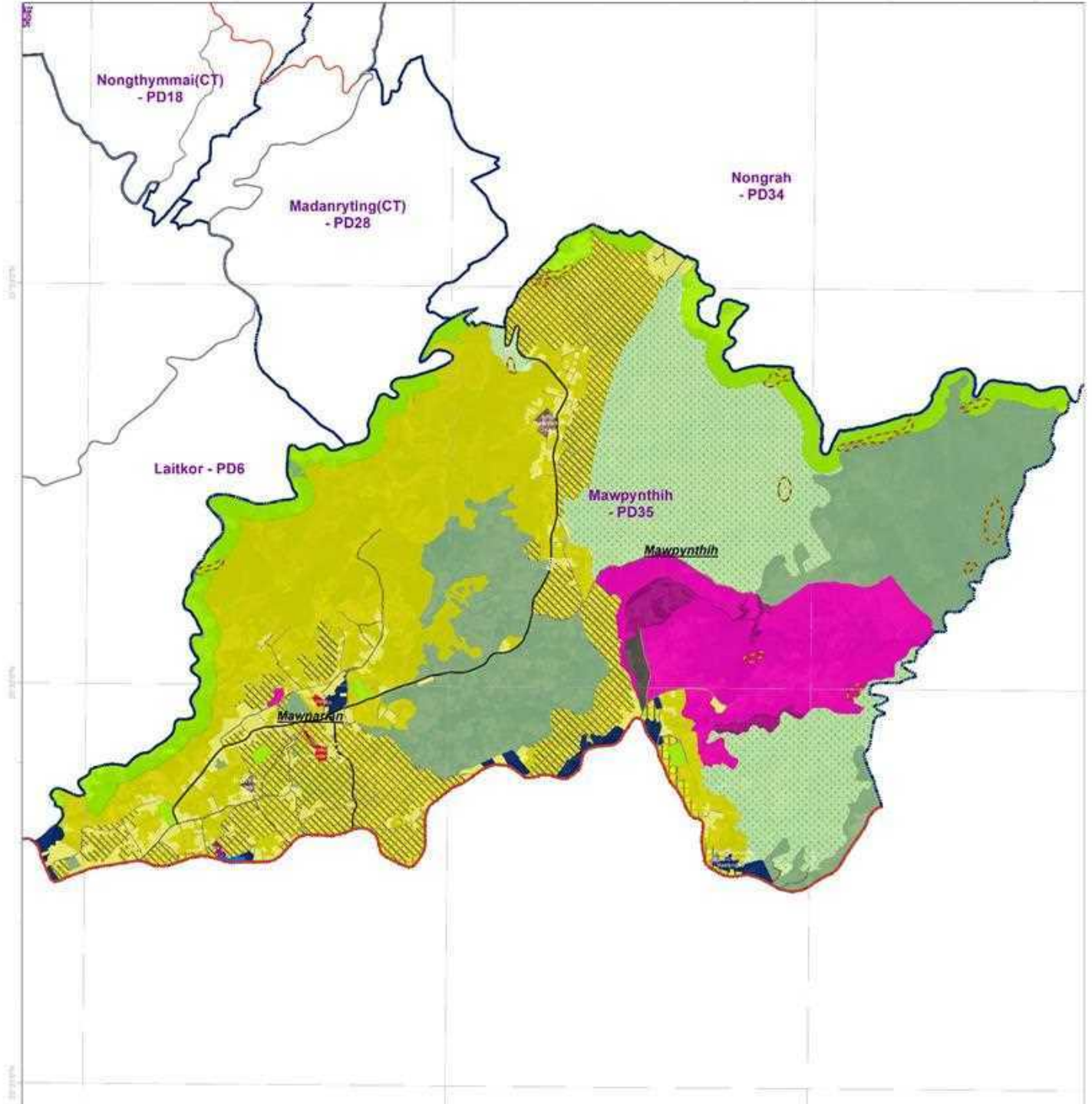
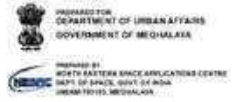
#### General Description about the Proposed Land Use in planning district:

The main land use categories in Mawpynthih are residential area and agriculture & allied activities, which covers 31.23% and 15.30% respectively of the total area (*Table 12-37*).

Additionally, an area of 2.13 Ha has been proposed for Recreational/ Green Buffer/ NDZ and 2.17 Ha for Transportation, thus making it to a total of 59.38 Ha and 14.96 Ha, respectively. The other proposed land uses are Commercial (6.86 Ha) and Mixed use (104.72 Ha).



FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 35 - MAWPYNTHIH**



**Legend**

- Baseline Info:**
- National Highway
  - State Highway
  - Major District Road
  - Other District Road
  - Bypass
  - Service Road
  - Major City Road
  - Minor City Road
  - Other Public Road
  - Other Private Road
  - Village road

- Administrative Boundary**
- District Boundary
- Planning Boundary**
- Planning Districts:
  - Inner Ring Road, 9m, 12m
  - Outer Ring Road, 12m
  - Peripheral Ring Road, 18m

- Proposed Roads and Land Use:**
- |                                    |     |     |
|------------------------------------|-----|-----|
| <b>Existing Road to be Widened</b> | 9m  | 9m  |
|                                    | 12m | 12m |
|                                    | 15m | 15m |
|                                    | 18m | 18m |
|                                    | 24m | 24m |
- Agriculture & Allied Activities
  - Water Sheet
  - Forest Area
  - Hazards Prone Area

EXI	PRO	CATEGORIES
[Yellow]	[Yellow]	Residential
[Blue]	[Blue]	Commercial
[Green]	[Green]	Mixed
[Magenta]	[Magenta]	Industrial
[Red]	[Red]	Public & Semi-public
[Brown]	[Brown]	Public Utilities
[Grey]	[Grey]	Transportation
[Light Green]	[Light Green]	Township
[Hatched]	[Hatched]	Defense Area / Military Zone
[Light Blue]	[Light Blue]	Recreational/ Green Buffer/ NDZ

Scale - 1:12,000

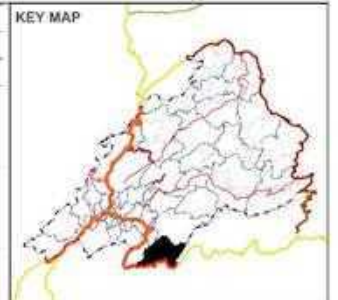


Figure 12-37: Proposed Land Use - PD35 - Mawpynthih

### 12.3.36 PLANNING DISTRICT NO.36 – UMIAM

**Area:** 736.93Hectares

**Location:** Peripheral Area

**Major Landmarks:** NESAC, NERIE, Orchid Lake Resort, Umiam Dam, Nehru Park (Figure 12-38).

Table 12-38: Proposed Landuse-PD36-Umiam

SNo	Categories	Area(Ha)	%age
1	Residential	62.87	8.53
2	Commercial	0.00	0.00
3	Mixed	87.79	11.91
4	Industrial	75.76	10.28
5	Public & Semi public	64.54	8.76
6	Public Utilities	1.16	0.16
7	Transportation	16.08	2.18
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	41.56	5.64
11	Agriculture & Allied Activities	265.32	36.00
12	Water Sheet	29.55	4.01
13	Forest Area	0.00	0.00
14	Hazards Prone Area	92.29	12.52
<b>Grand Total</b>		<b>736.93</b>	<b>100</b>

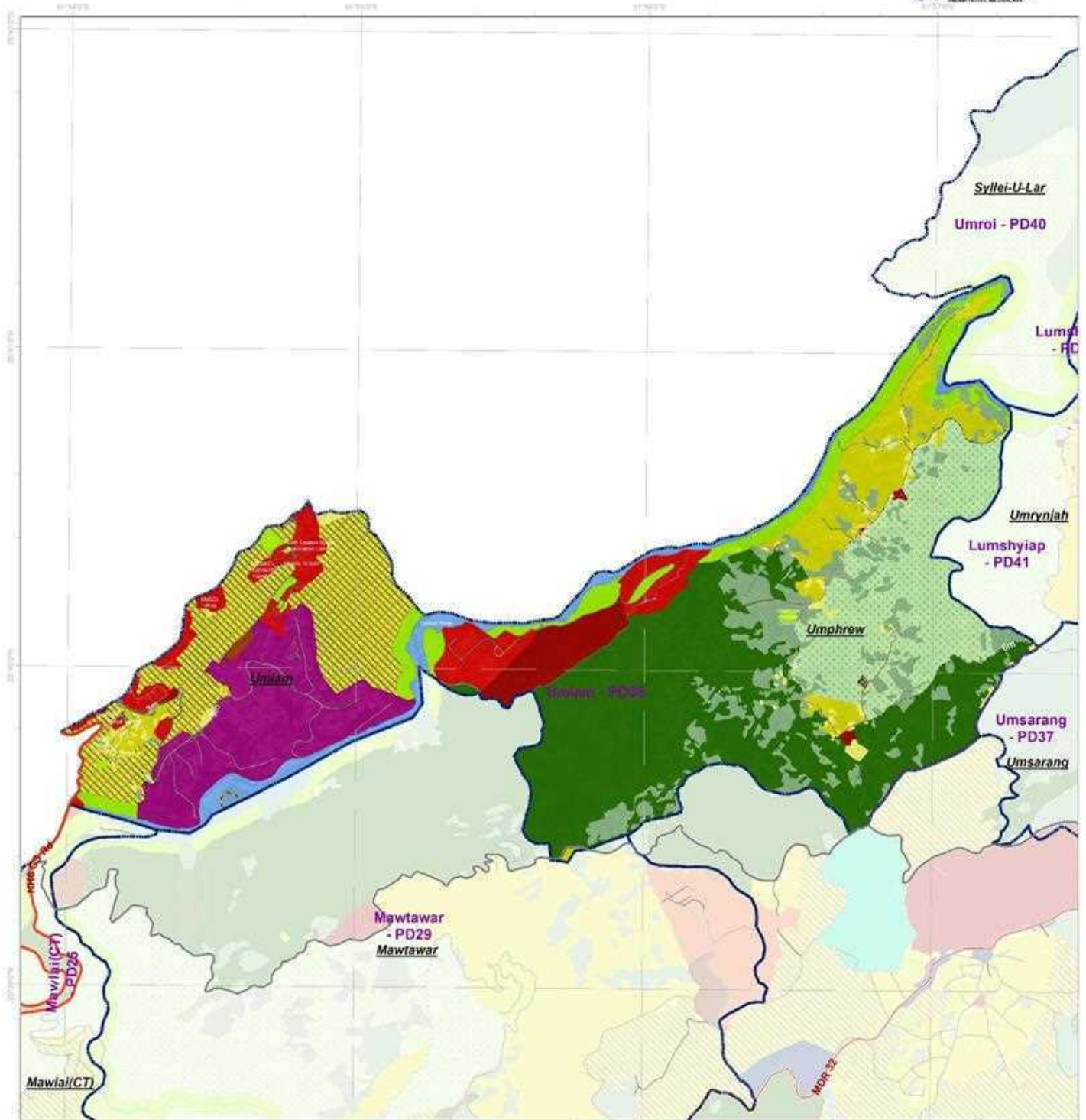
#### General Description about the Proposed Land Use in planning district:

The dominant land use categories in Umiam is Agriculture & Allied Activities, which covers 36.00% respectively of the total area (Table 12-38).

The major proposed Land uses include residential area of 62.87 Ha (Existing: 11.05 Ha) and Public & Semi-public of 64.54 Ha (Existing: 43.61 Ha) in the planning district contributing to 8.53% and 8.76% respectively.

Additionally, an area of 0.26 Ha has been proposed for Recreational/ Green Buffer/ NDZ, thus making it to a total of 41.56Ha, representing 5.64% of the total area.

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 36 - UMIAM**



**Legend**

- Baseline Info:**
- National Highway
  - State Highway
  - Major District Road
  - Other District Road
  - Bypass
  - Service Road
  - Major City Road
  - Minor City Road
  - Other Public Road
  - Other Private Road
  - Village road
- Administrative Boundary**
- District Boundary
- Planning Boundary**
- Planning Districts:
  - Inner Ring Road, 9m, 12m
  - Outer Ring Road, 12m
  - Peripheral Ring Road, 18m

- Proposed Roads and Land Use:**
- | Existing Road to be Widened | Proposed Road |
|-----------------------------|---------------|
| 9m                          | 9m            |
| 12m                         | 12m           |
| 15m                         | 15m           |
| 18m                         | 18m           |
| 24m                         | 24m           |
- Agriculture & Allied Activities
  - Water Sheet
  - Forest Area
  - Hazards Prone Area

EXI	PRO	CATEGORIES
[Yellow]	[Yellow]	Residential
[Blue]	[Blue]	Commercial
[Green]	[Green]	Mixed
[Red]	[Red]	Industrial
[Purple]	[Purple]	Public & Semi-public
[Brown]	[Brown]	Public Utilities
[Grey]	[Grey]	Transportation
[Light Green]	[Light Green]	Township
[Hatched]	[Hatched]	Defense Area / Military Zone
[Light Blue]	[Light Blue]	Recreational/ Green Buffer/ NDZ



Scale - 1:15,000 0 100 200 400 600 800 1,000 Meters

Figure 12-38: Proposed Land Use - PD36 - Umiar

### 12.3.37 PLANNING DISTRICT NO.37 – UMSARANG

**Area:** 1046.67Hectares

**Location:** Peripheral Area

**Major Landmarks:** St. Mark Church, Mawsiatkhnam Public Health Centre (*Figure 12-39*).

Table 12-39: Proposed Landuse-PD37- Umsarang

SNo	Categories	Area(Ha)	%age
1	Residential	350.97	34.04
2	Commercial	20.77	2.02
3	Mixed	163.55	15.86
4	Industrial	9.54	0.93
5	Public & Semipublic	9.95	0.96
6	Public Utilities	4.18	0.41
7	Transportation	36.34	3.52
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	29.79	2.89
11	Agriculture & Allied Activities	373.71	36.25
12	Water Sheet	3.29	0.32
13	Forest Area	0.00	0.00
14	Hazards Prone Area	28.82	2.80
<b>Grand Total</b>		<b>1046.67</b>	<b>100</b>

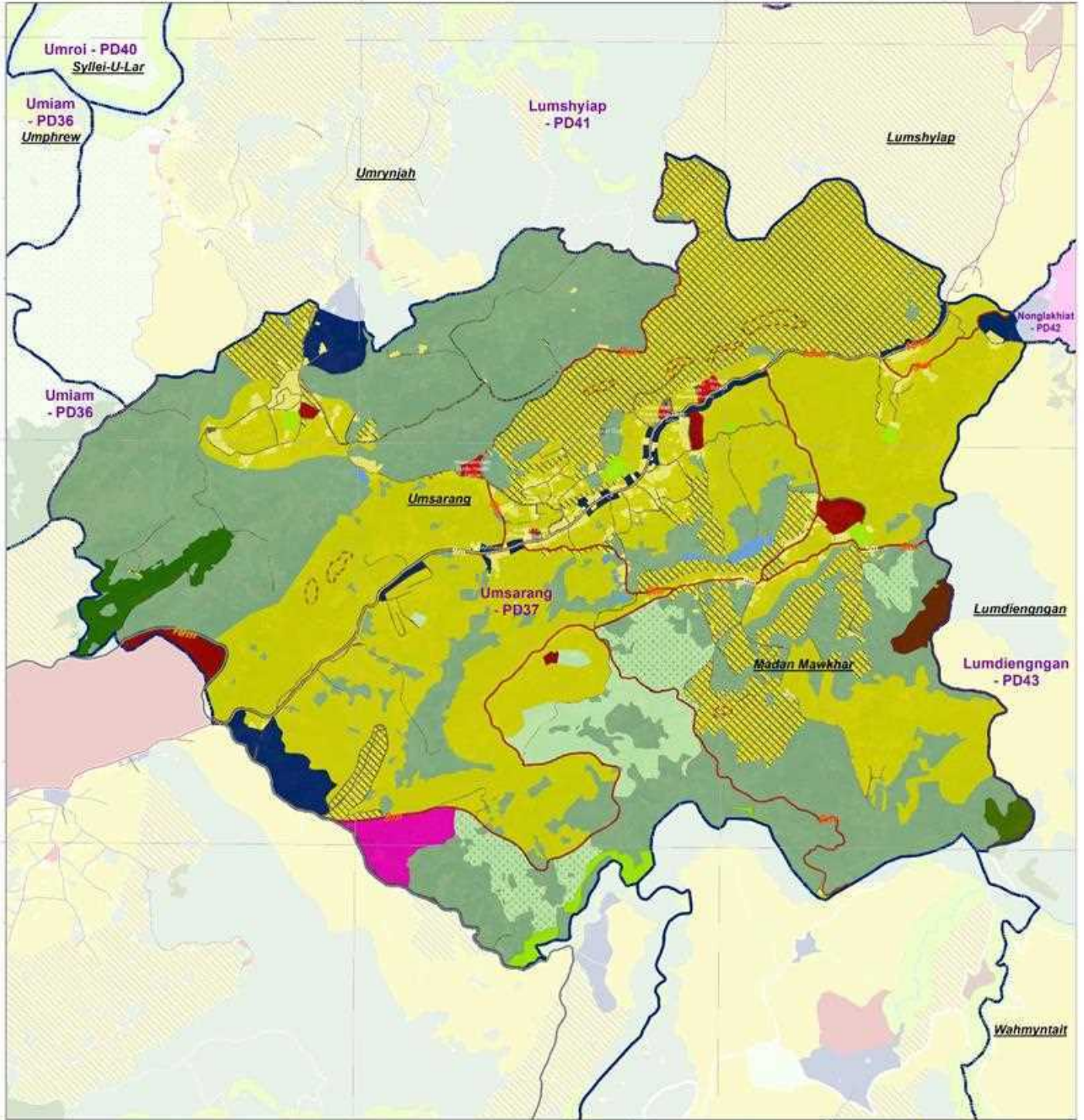
#### General Description about the Proposed Land Use in planning district:

The predominant land use categories in Umsarang is agriculture & allied activities, which covers 36.25% of the total area (*Table 12-39*).

The major proposed land uses include residential area of 350.97Ha (Existing: 20.21 Ha), Commercial of 20.77 Ha and Industrial of 9.54 Ha in the planning district contributing to 34.04%, 2.02% and 0.93% respectively. Additionally, an area of 3.53Ha has been proposed for Recreational/ Green Buffer/ NDZ, thus making it to a total of 29.79Ha, representing 2.89% of the total area.

The other proposed land uses are Transportation (36.34Ha), Public & Semi-public (9.95Ha) and mixed use (163.55Ha).

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 37 - UMSARANG**



**Legend**

<p><b>Baseline Info:</b></p> <ul style="list-style-type: none"> <li>National Highway</li> <li>State Highway</li> <li>Major District Road</li> <li>Other District Road</li> <li>Bypass</li> <li>Service Road</li> <li>Major City Road</li> <li>Minor City Road</li> <li>Other Public Road</li> <li>Other Private Road</li> <li>Village road</li> </ul>	<p><b>Administrative Boundary</b></p> <ul style="list-style-type: none"> <li>District Boundary</li> </ul> <p><b>Planning Boundary</b></p> <ul style="list-style-type: none"> <li>Planning Districts:</li> <li>Inner Ring Road, 9m, 12m</li> <li>Outer Ring Road, 12m</li> <li>Peripheral Ring Road, 18m</li> </ul>	<p><b>Proposed Roads and Land Use:</b></p> <table border="0"> <tr> <td style="vertical-align: top;"> <p><b>Existing Road to be Widened</b></p> <ul style="list-style-type: none"> <li>9m</li> <li>12m</li> <li>15m</li> <li>18m</li> <li>24m</li> </ul> </td> <td style="vertical-align: top;"> <p><b>Proposed Road</b></p> <ul style="list-style-type: none"> <li>9m</li> <li>12m</li> <li>15m</li> <li>18m</li> <li>24m</li> </ul> </td> </tr> </table> <ul style="list-style-type: none"> <li>Agriculture &amp; Allied Activities</li> <li>Water Sheet</li> <li>Forest Area</li> <li>Hazards Prone Area</li> </ul>	<p><b>Existing Road to be Widened</b></p> <ul style="list-style-type: none"> <li>9m</li> <li>12m</li> <li>15m</li> <li>18m</li> <li>24m</li> </ul>	<p><b>Proposed Road</b></p> <ul style="list-style-type: none"> <li>9m</li> <li>12m</li> <li>15m</li> <li>18m</li> <li>24m</li> </ul>	<table border="0"> <tr> <td style="text-align: center;"><b>EXI</b></td> <td style="text-align: center;"><b>PRO</b></td> <td style="text-align: center;"><b>CATEGORIES</b></td> </tr> <tr> <td style="text-align: center;">[Yellow Box]</td> <td style="text-align: center;">[Yellow Box]</td> <td>Residential</td> </tr> <tr> <td style="text-align: center;">[Blue Box]</td> <td style="text-align: center;">[Blue Box]</td> <td>Commercial</td> </tr> <tr> <td style="text-align: center;">[Green Box]</td> <td style="text-align: center;">[Green Box]</td> <td>Mixed</td> </tr> <tr> <td style="text-align: center;">[Red Box]</td> <td style="text-align: center;">[Red Box]</td> <td>Industrial</td> </tr> <tr> <td style="text-align: center;">[Orange Box]</td> <td style="text-align: center;">[Orange Box]</td> <td>Public &amp; Semi-public</td> </tr> <tr> <td style="text-align: center;">[Brown Box]</td> <td style="text-align: center;">[Brown Box]</td> <td>Public Utilities</td> </tr> <tr> <td style="text-align: center;">[Grey Box]</td> <td style="text-align: center;">[Grey Box]</td> <td>Transportation</td> </tr> <tr> <td style="text-align: center;">[Light Green Box]</td> <td style="text-align: center;">[Light Green Box]</td> <td>Township</td> </tr> <tr> <td style="text-align: center;">[Hatched Box]</td> <td style="text-align: center;">[Hatched Box]</td> <td>Defense Area / Military Zone</td> </tr> <tr> <td style="text-align: center;">[Light Blue Box]</td> <td style="text-align: center;">[Light Blue Box]</td> <td>Recreational/ Green Buffer/ NDZ</td> </tr> </table>	<b>EXI</b>	<b>PRO</b>	<b>CATEGORIES</b>	[Yellow Box]	[Yellow Box]	Residential	[Blue Box]	[Blue Box]	Commercial	[Green Box]	[Green Box]	Mixed	[Red Box]	[Red Box]	Industrial	[Orange Box]	[Orange Box]	Public & Semi-public	[Brown Box]	[Brown Box]	Public Utilities	[Grey Box]	[Grey Box]	Transportation	[Light Green Box]	[Light Green Box]	Township	[Hatched Box]	[Hatched Box]	Defense Area / Military Zone	[Light Blue Box]	[Light Blue Box]	Recreational/ Green Buffer/ NDZ	<p><b>KEY MAP</b></p>
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Scale - 1:12,000 0 100 200 400 600 800 Meters

Figure 12-39: Proposed Land Use - PD37 - Umsarang



### 12.3.38 PLANNING DISTRICT NO.38 – SAISIEJ

**Area:** 960.38Hectares

**Location:** Peripheral Area

**Major Landmarks:** New Shillong Techno Site, Saisiej Catholic Church (*Figure 12-40*).

Table 12-40: Proposed Landuse-PD38-Saisiej

SNo	Categories	Area(Ha)	%age
1	Residential	258.52	26.92
2	Commercial	21.92	2.28
3	Mixed	101.18	10.54
4	Industrial	0.00	0.00
5	Public & Semi public	22.96	2.39
6	Public Utilities	12.00	1.25
7	Transportation	28.00	2.92
8	Township	31.10	3.24
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	41.77	4.35
11	Agriculture & Allied Activities	385.10	40.10
12	Water Sheet	5.74	0.60
13	Forest Area	0.00	0.00
14	Hazards Prone Area	52.08	5.42
<b>Grand Total</b>		<b>960.38</b>	<b>100</b>

#### General Description about the Proposed Land Use in planning district:

The predominant land use categories in Saisiej are mixed and agriculture & allied activities, which covers 10.54% and 40.10% respectively of the total area (*Table 12-40*).

The major proposed land uses include residential area of 258.52 Ha (Existing: 9.76Ha), Public & Semi-public of 22.96Ha (Existing: 0.90Ha) and commercial of 21.92Ha (Existing: 0.01Ha) in the planning district contributing to 26.92%, 2.39% and 2.28% respectively. Additionally, an area of 4.41Ha has been proposed for Recreational/ Green Buffer/ NDZ, thus making it to a total of 41.77Ha, representing 4.35% of the total area.

The other proposed land uses are Mixed use (101.18 Ha) and Public Utilities (12.00 Ha).

In the township area, the permission are subject to the authority and decision taken by the authority in this regard shall be final.



### 12.3.39 PLANNING DISTRICT NO.39 – MAWPDANG

**Area:** 1843.90Hectares

**Location:** Peripheral Area

**Major Landmarks:** Franciscan Outreach, Vendrame Training Institute, Nela Handloom Centre, Tynring Presbyterian School (*Figure 12-41*).

**Table 12-41: Proposed Landuse-PD39-Mawpdang**

SNo	Categories	Area(Ha)	%age
1	Residential	498.72	27.05
2	Commercial	43.54	2.36
3	Mixed	169.46	9.19
4	Industrial	0.93	0.05
5	Public & Semi public	76.29	4.14
6	Public Utilities	0.55	0.03
7	Transportation	80.56	4.37
8	Township	145.44	7.89
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	216.14	11.72
11	Agriculture & Allied Activities	427.65	23.19
12	Water Sheet	20.80	1.13
13	Forest Area	0.00	0.00
14	Hazards Prone Area	163.76	8.88
<b>Grand Total</b>		<b>1843.90</b>	<b>100</b>

#### **General Description about the Proposed Land Use in planning district:**

The predominant land use category in Mawpdang is residential, which covers 27.05% of the total area (*Table 12-41*).

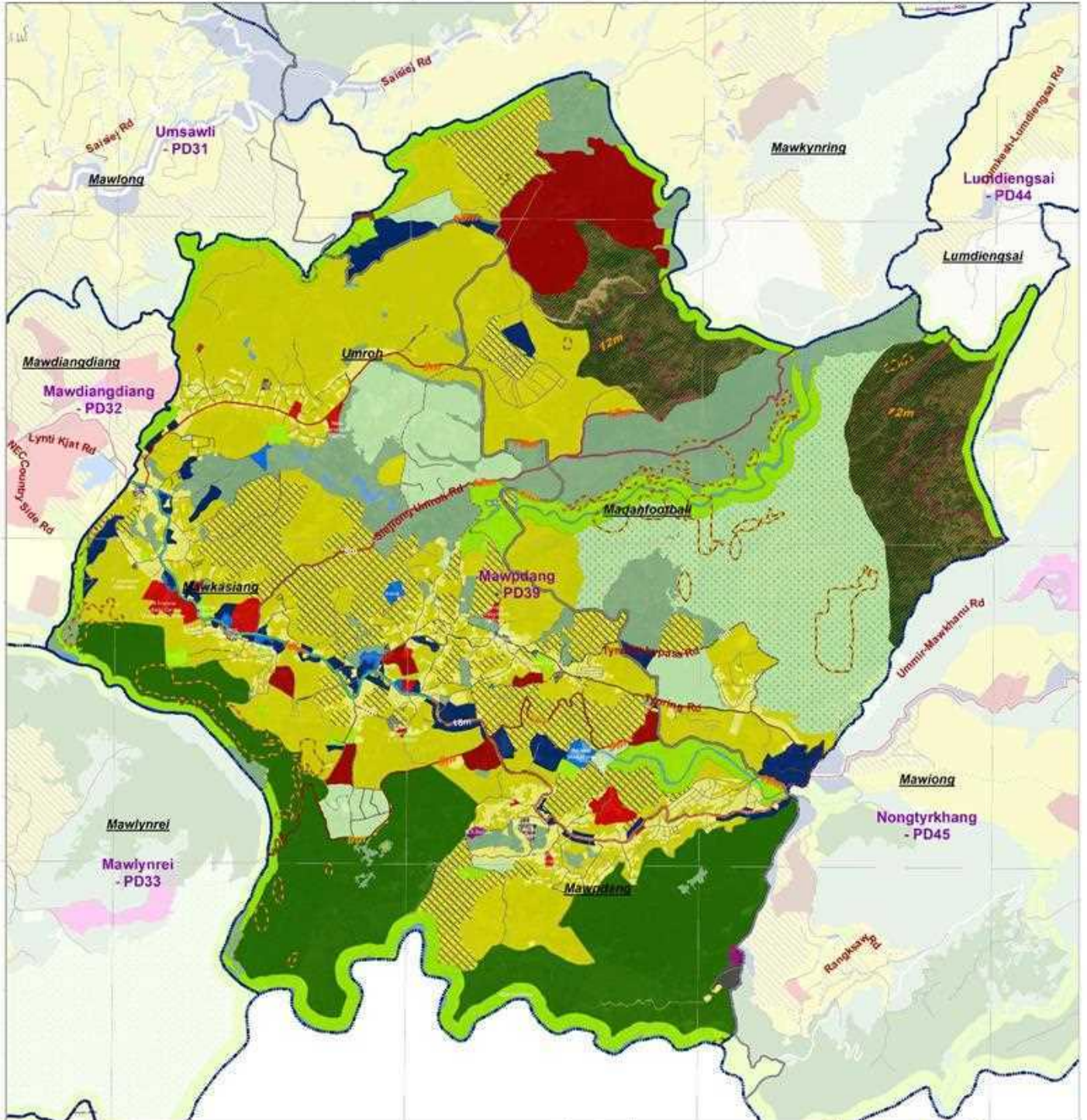
The major proposed Land uses include mixed area of 169.46 Ha, and Transportation of 80.56 Ha (Existing: 79.44Ha) and Public & Semi-public of 76.29 Ha (Existing: 15.68 Ha) in the planning district contributing to 9.19%, 4.37% and 4.14% respectively.

Additionally, area has been proposed for Recreational/ Green Buffer/ NDZ, thus making it to a total of 216.14Ha, representing 11.72% of the total area.

In the township area, the permission are subject to the authority and decision taken by the authority in this regard shall be final.



FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 39 - MAWPDANG**



**Legend**

<p><b>Baseline Info:</b></p> <ul style="list-style-type: none"> <li><span style="color: red;">—</span> National Highway</li> <li><span style="color: orange;">—</span> State Highway</li> <li><span style="color: brown;">—</span> Major District Road</li> <li><span style="color: grey;">—</span> Other District Road</li> <li><span style="color: black;">—</span> Bypass</li> <li><span style="color: blue;">—</span> Service Road</li> <li><span style="color: black;">—</span> Major City Road</li> <li><span style="color: black;">—</span> Minor City Road</li> <li><span style="color: black;">—</span> Other Public Road</li> <li><span style="color: black;">—</span> Other Private Road</li> <li><span style="color: black;">—</span> Village road</li> </ul>	<p><b>Administrative Boundary</b></p> <ul style="list-style-type: none"> <li><span style="border: 1px dashed black; display: inline-block; width: 10px; height: 10px;"></span> District Boundary</li> </ul> <p><b>Planning Boundary</b></p> <ul style="list-style-type: none"> <li><span style="border: 1px solid black; 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**Scale - 1:15,000** 0 100 200 400 600 800 1,000 Meters

Figure 12-41: Proposed Land Use - PD39 - Mawpdang



### 12.3.40 PLANNING DISTRICT NO.40 – UMROI

**Area:** 1125.24Hectares

**Location:** Peripheral Area

**Major Landmarks:** Shillong Airport, Holy Redeemer Renewal Centre, Tyndai Resort, Iew San Shnong (Figure 12-42).

Table 12-42: Proposed Landuse-PD40-Umroi

SNo	Categories	Area(Ha)	%age
1	Residential	146.32	13.00
2	Commercial	30.96	2.75
3	Mixed	50.58	4.50
4	Industrial	0.91	0.08
5	Public & Semipublic	20.05	1.78
6	Public Utilities	0.00	0.00
7	Transportation	287.35	25.54
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	58.16	5.17
11	Agriculture & Allied Activities	415.78	36.95
12	Water Sheet	26.81	2.38
13	Forest Area	0.00	0.00
14	Hazards Prone Area	88.30	7.85
<b>Grand Total</b>		<b>1125.24</b>	<b>100</b>

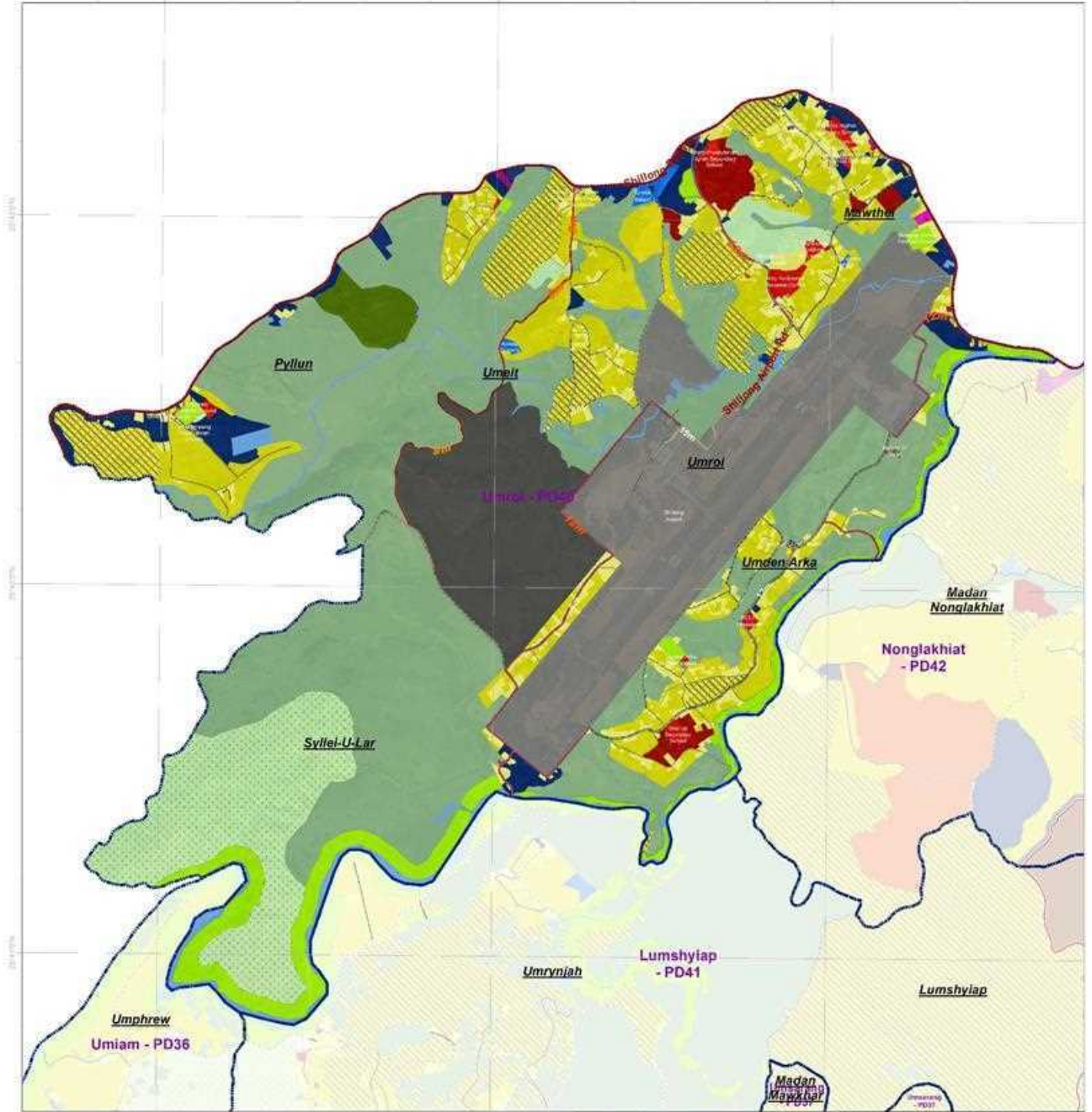
#### General Description about the Proposed Land Use in planning district:

The predominant land use category in Umroi is agriculture & allied activities, which covers 36.95% of the total area (Table 12-42).

The major proposed Land uses include Transportation of 287.35 Ha (Existing: 206.60 Ha), Residential area of 146.32 Ha (Existing: 40.54 Ha) and Commercial of 30.96 Ha (Existing: 2.63Ha) in the planning district contributing to 25.54%, 13.00% and 2.75% respectively.

Additionally, area has been proposed for Recreational/ Green Buffer/ NDZ, thus making it to a total of 58.16 Ha, representing 5.17% of the total area.

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 40 - UMROI**



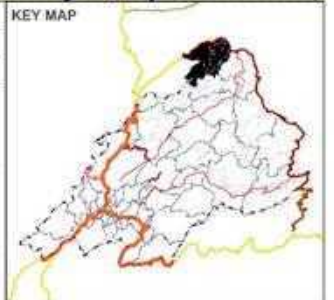
**Legend**

- Baseline Info:**
- National Highway
  - State Highway
  - Major District Road
  - Other District Road
  - Bypass
  - Service Road
  - Major City Road
  - Minor City Road
  - Other Public Road
  - Other Private Road
  - Village road

- Administrative Boundary**
- District Boundary
- Planning Boundary**
- Planning Districts:
  - Inner Ring Road, 9m, 12m
  - Outer Ring Road, 12m
  - Peripheral Ring Road, 18m

- Proposed Roads and Land Use:**
- |                             |               |
|-----------------------------|---------------|
| Existing Road to be Widened | Proposed Road |
| 9m                          | 9m            |
| 12m                         | 12m           |
| 15m                         | 15m           |
| 18m                         | 18m           |
| 24m                         | 24m           |
- Agriculture & Allied Activities
  - Water Sheet
  - Forest Area
  - Hazards Prone Area

EXI	PRO	CATEGORIES
[Yellow]	[Yellow]	Residential
[Blue]	[Blue]	Commercial
[Green]	[Green]	Mixed
[Red]	[Red]	Industrial
[Purple]	[Purple]	Public & Semi-public
[Brown]	[Brown]	Public Utilities
[Grey]	[Grey]	Transportation
[Light Green]	[Light Green]	Township
[Dark Green]	[Dark Green]	Defense Area / Military Zone
[Light Blue]	[Light Blue]	Recreational/ Green Buffer/ NDZ



Scale - 1:13,000

Figure 12-42: Proposed Land Use - PD40 - Umroi

### 12.3.41 PLANNING DISTRICT NO.41 – LUMSHYIAP

**Area:** 775.90Hectares

**Location:** Peripheral Area

**Major Landmarks:** Umrynjah Health Sub-Centre, Umjathang, Lumshyiap (*Figure 12-43*).

Table 12-43: Proposed Landuse-PD41-Lumshyiap

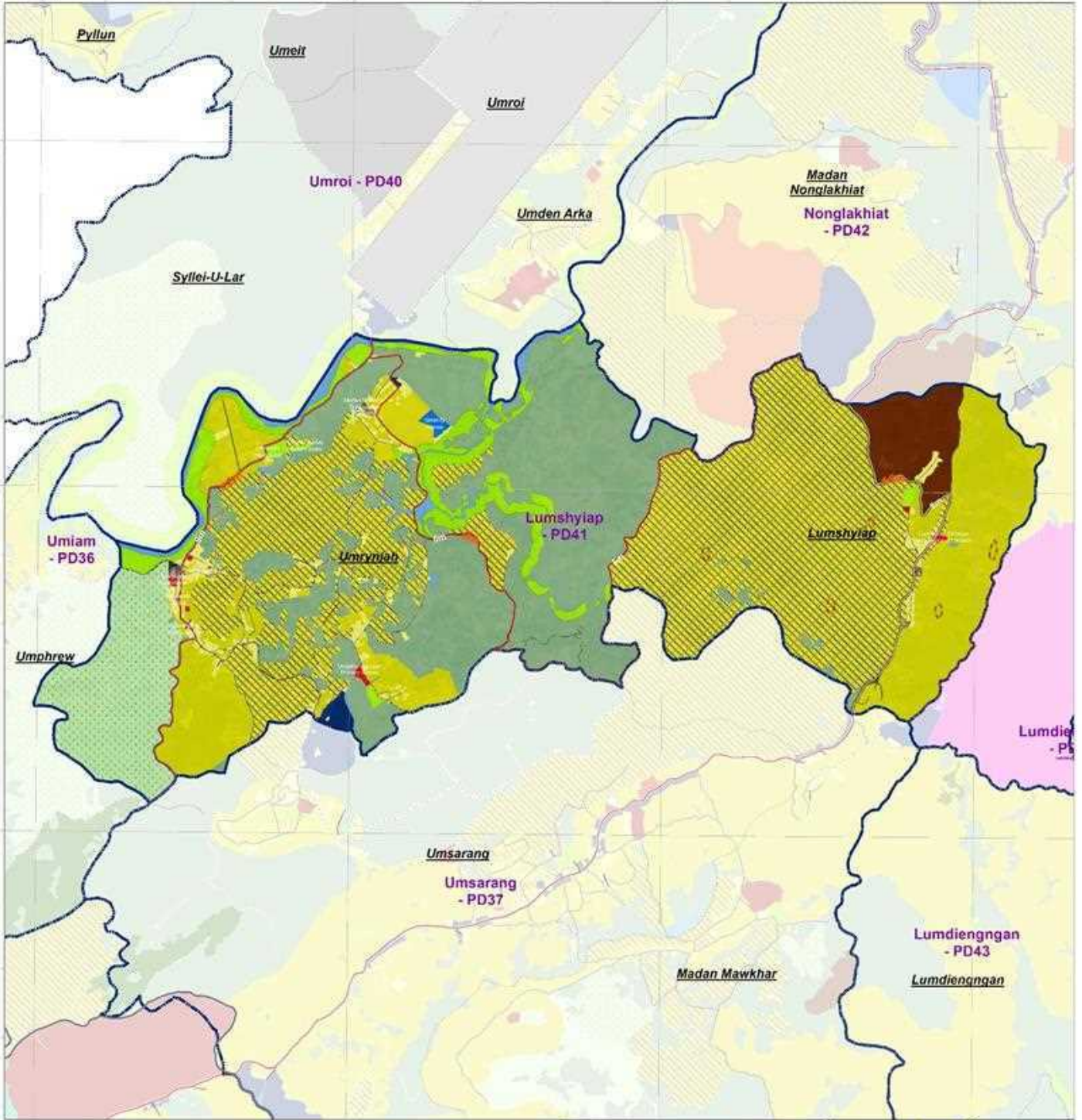
SNo	Categories	Area(Ha)	%age
1	Residential	143.98	18.54
2	Commercial	3.47	0.45
3	Mixed	263.38	33.91
4	Industrial	0.00	0.00
5	Public & Semipublic	2.01	0.26
6	Public Utilities	22.98	2.96
7	Transportation	20.43	2.63
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	35.43	4.56
11	Agriculture & Allied Activities	215.27	27.71
12	Water Sheet	13.25	1.71
13	Forest Area	0.00	0.00
14	Hazards Prone Area	56.52	7.28
<b>Grand Total</b>		<b>775.90</b>	<b>100</b>

#### General Description about the Proposed Land Use in planning district:

The predominant land use categories in Lumshyiap are mixed and agriculture & allied activities, which covers 33.91% and 27.71% respectively of the total area (*Table 12-43*).

The major proposed land uses include residential area of 143.98 Ha (Existing: 14.43 Ha) and water sheet of 13.25 Ha in the planning district contributing 18.54% and 1.71% respectively.

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 41 - LUMSHYIAP**



**Legend**

- Baseline Info:**
- National Highway
  - State Highway
  - Major District Road
  - Other District Road
  - Bypass
  - Service Road
  - Major City Road
  - Minor City Road
  - Other Public Road
  - Other Private Road
  - Village road
- Administrative Boundary**
- District Boundary
- Planning Boundary**
- Planning Districts:
  - Inner Ring Road, 9m, 12m
  - Outer Ring Road, 12m
  - Peripheral Ring Road, 18m

- Proposed Roads and Land Use:**
- | Existing Road to be Widened | Proposed Road |
|-----------------------------|---------------|
| 9m                          | 9m            |
| 12m                         | 12m           |
| 15m                         | 15m           |
| 18m                         | 18m           |
| 24m                         | 24m           |
- Agriculture & Allied Activities
  - Water Sheet
  - Forest Area
  - Hazards Prone Area

EXI	PRO	CATEGORIES
[Yellow]	[Yellow]	Residential
[Blue]	[Blue]	Commercial
[Green]	[Green]	Mixed
[Red]	[Red]	Industrial
[Purple]	[Purple]	Public & Semi-public
[Brown]	[Brown]	Public Utilities
[Grey]	[Grey]	Transportation
[Light Green]	[Light Green]	Township
[Dark Green]	[Dark Green]	Defense Area / Military Zone
[Light Blue]	[Light Blue]	Recreational/ Green Buffer/ NDZ



Scale - 1:14,000

Figure 12-43: Proposed Land Use - PD41 - Lumshyiap

### 12.3.42 PLANNING DISTRICT NO.42 –NONGLAKHIAT

**Area:** 1007.49Hectares

**Location:** Peripheral Area

**Major Landmarks:** Don Bosco Aspirantate, Fire Bridge, Office of Eastern Ri Bhoi Organic FPC (Figure 12-44).

Table 12-44: Proposed Landuse-PD42-Nonglakhiat

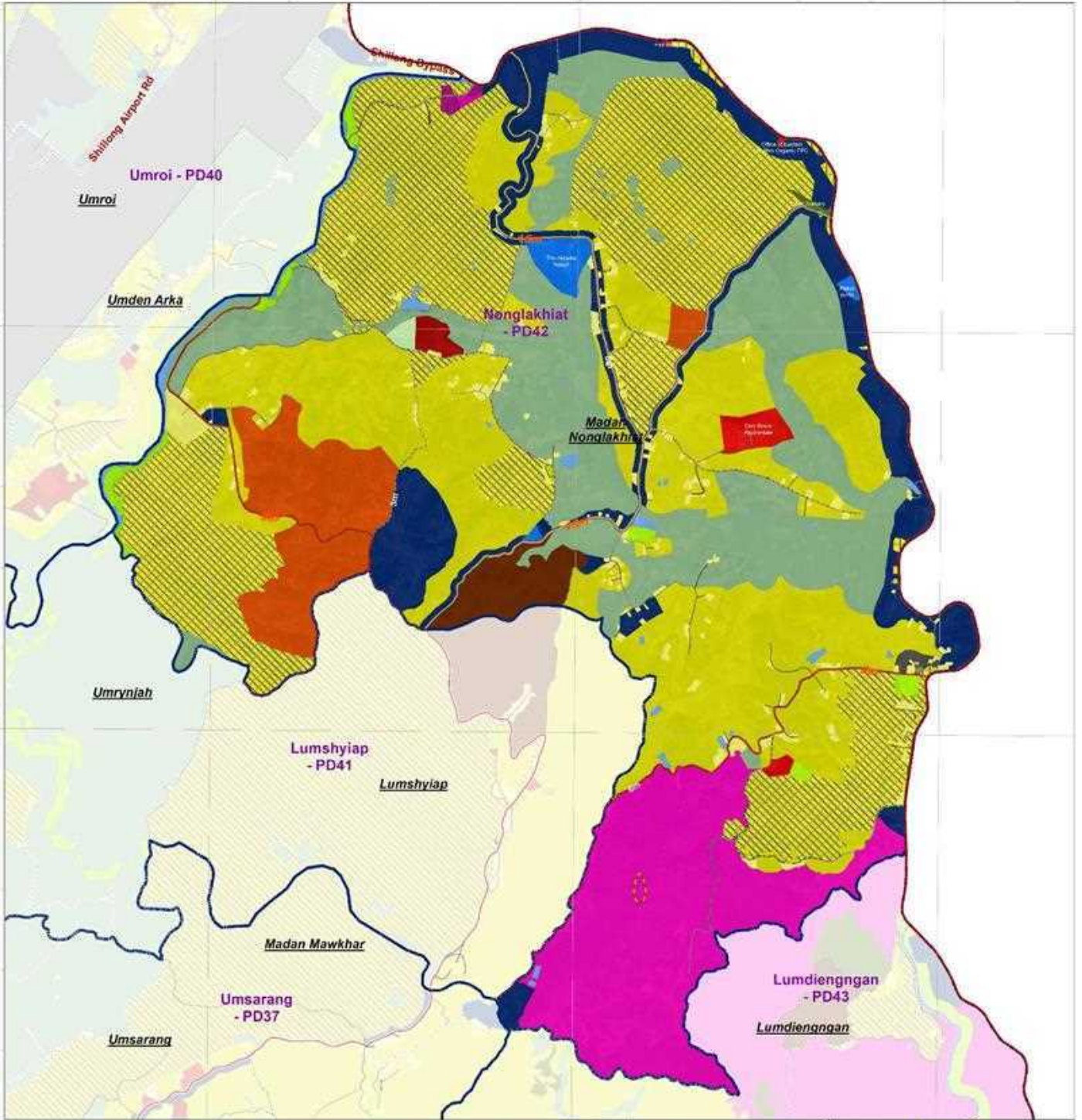
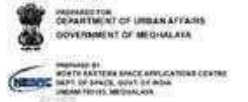
SNo	Categories	Area(Ha)	%age
1	Residential	263.01	26.12
2	Commercial	85.42	8.48
3	Mixed	247.68	24.60
4	Industrial	114.28	11.35
5	Public & Semi public	8.72	0.87
6	Public Utilities	14.55	1.45
7	Transportation	27.73	2.75
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	7.92	0.79
11	Agriculture & Allied Activities	228.96	22.74
12	Water Sheet	8.73	0.87
13	Forest Area	0.00	0.00
14	Hazards Prone Area	0.00	0.00
<b>Grand Total</b>		<b>1007.49</b>	<b>100</b>

#### General Description about the Proposed Land Use in planning district:

The major proposed land uses include Agriculture & Allied Activities of 228.96 Ha (Existing: 425.29Ha), Residential area of 263.01 Ha (Existing: 19.17 Ha) and Commercial area of 85.42 Ha (Existing: 6.25Ha) in the planning district contributing 22.74%, 26.12% and 8.48% respectively. Additionally, area has been proposed for mixed use, thus making it to a total of 247.68Ha, representing 24.60% of the total area (Table 12-44).

The other proposed land uses are Public & Semi-public (8.72 Ha), Recreational/ Green Buffer/ NDZ (7.92 Ha) and Industrial (114.28 Ha).

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
PLANNING DISTRICTS - 42 - NONGLAKHIAT



Legend		Proposed Roads and Land Use		EXI	PRO	CATEGORIES	KEY MAP
<b>Baseline Info:</b>		<b>Existing Road to be Widened</b>		[Yellow]	[Yellow]	Residential	
National Highway		[12m]	[12m]	[Blue]	[Blue]	Commercial	
State Highway		[15m]	[15m]	[Diagonal lines]	[Diagonal lines]	Mixed	
Major District Road		[18m]	[18m]	[Pink]	[Pink]	Industrial	
Other District Road		[24m]	[24m]	[Red]	[Red]	Public & Semi-public	
Bypass		[Green]	[Green]	[Brown]	[Brown]	Public Utilities	
Service Road		[Blue]	[Blue]	[Grey]	[Grey]	Transportation	
Major City Road		[Light Green]	[Light Green]	[Light Grey]	[Light Grey]	Township	
Minor City Road		[Dark Green]	[Dark Green]	[Hatched]	[Hatched]	Defense Area / Military Zone	
Other Public Road		[Light Blue]	[Light Blue]	[Light Green]	[Light Green]	Recreational/ Green Buffer/ NDZ	
Other Private Road		<b>Proposed Road</b>					
Village road		[9m]	[9m]				
<b>Administrative Boundary</b>		[12m]	[12m]				
District Boundary		[15m]	[15m]				
<b>Planning Boundary</b>		[18m]	[18m]				
Planning Districts:		[24m]	[24m]				
Inner Ring Road, 9m, 12m		[Green]	[Green]	Agriculture & Allied Activities			
Outer Ring Road, 12m		[Blue]	[Blue]	Water Sheet			
Peripheral Ring Road, 18m		[Dark Green]	[Dark Green]	Forest Area			
		[Light Green]	[Light Green]	Hazards Prone Area			

Scale - 1:12,000

Figure 12-44: Proposed Land Use - PD42 - Nonglakhiat



### 12.3.43 PLANNING DISTRICT NO.43 –LUMDIENGNAN

**Area:** 1464.37Hectares

**Location:** Peripheral Area

**Major Landmarks:** Wansuk & Leitsuk, Rangmen, Wahmyntait (*Figure 12-45*).

Table 12-45: Proposed Landuse-PD43-Lumdiengngan

SNo	Categories	Area(Ha)	%age
1	Residential	452.53	30.95
2	Commercial	9.85	0.67
3	Mixed	116.31	7.95
4	Industrial	424.47	29.03
5	Public & Semi public	1.00	0.07
6	Public Utilities	15.71	1.07
7	Transportation	38.36	2.62
8	Township	0.00	0.00
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	48.57	3.32
11	Agriculture & Allied Activities	344.60	23.57
12	Water Sheet	10.54	0.72
13	Forest Area	0.00	0.00
14	Hazards Prone Area	0.18	0.01
<b>Grand Total</b>		<b>1464.37</b>	<b>100</b>

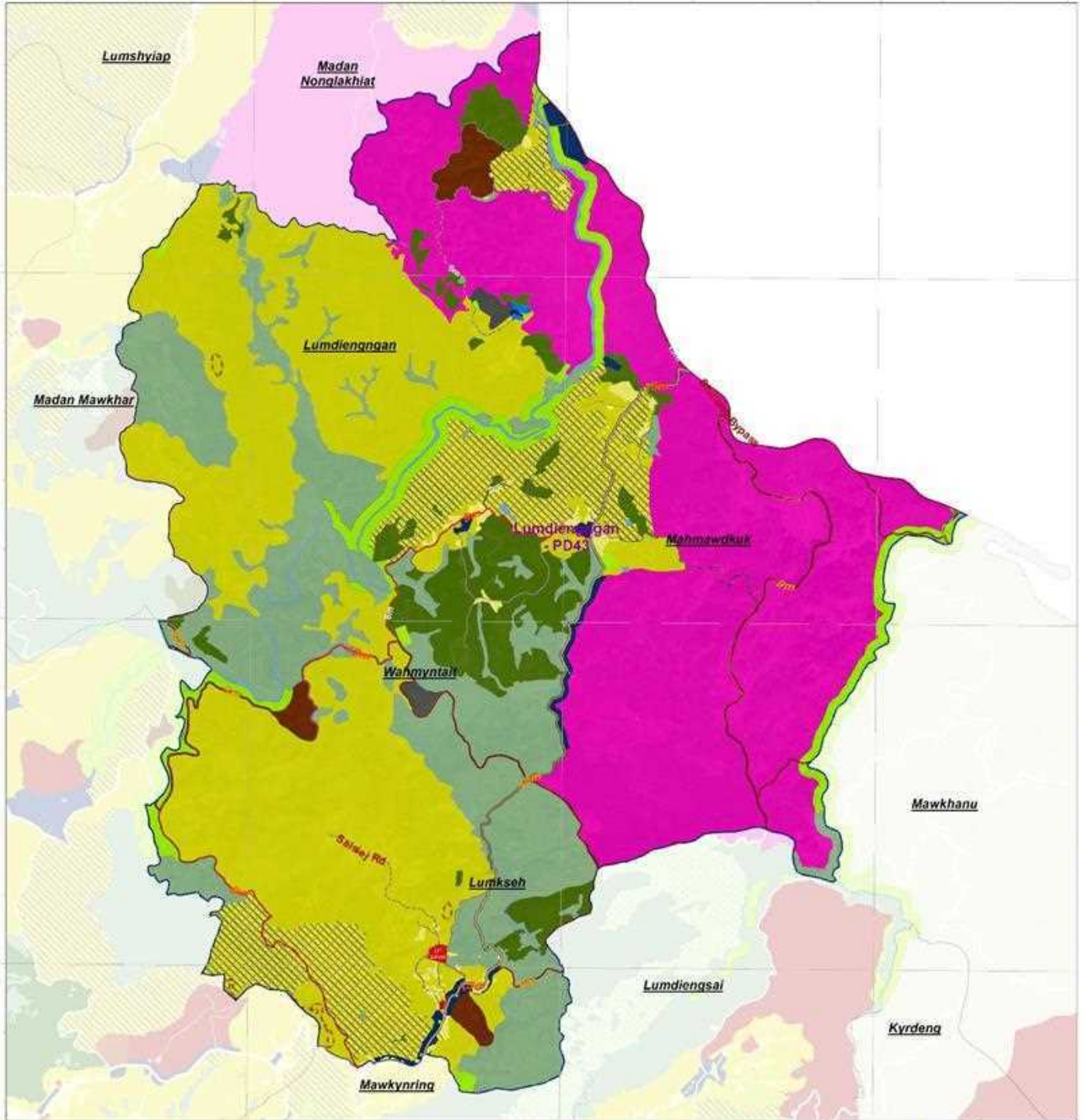
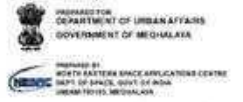
#### General Description about the Proposed Land Use in planning district:

The predominant land use categories in Lumdiengngan are residential and industry, which covers 30.95% and 29.03% respectively of the total area.

The major proposed land uses include mixed area of 116.31Ha, Residential area of 452.53Ha (Existing: 9.00 Ha) and Commercial area of 9.85Ha (Existing: 0.55 Ha) in the planning district contributing 7.95%, 30.95% and 1% respectively (*Table 12-45*).



FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 43 - LUMDIENGNAN**



**Legend**

- Baseline Info:**
- National Highway
  - State Highway
  - Major District Road
  - Other District Road
  - Bypass
  - Service Road
  - Major City Road
  - Minor City Road
  - Other Public Road
  - Other Private Road
  - Village road
- Administrative Boundary**
- District Boundary
- Planning Boundary**
- Planning Districts:
  - Inner Ring Road, 9m, 12m
  - Outer Ring Road, 12m
  - Peripheral Ring Road, 18m

- Proposed Roads and Land Use:**
- | Existing Road to be Widened | Proposed Road |
|-----------------------------|---------------|
| 9m                          | 9m            |
| 12m                         | 12m           |
| 15m                         | 15m           |
| 18m                         | 18m           |
| 24m                         | 24m           |
- Agriculture & Allied Activities
  - Water Sheet
  - Forest Area
  - Hazards Prone Area

EXI	PRO	CATEGORIES
[Yellow]	[Yellow]	Residential
[Blue]	[Blue]	Commercial
[Green]	[Green]	Mixed
[Red]	[Red]	Industrial
[Brown]	[Brown]	Public & Semi-public
[Grey]	[Grey]	Public Utilities
[Light Grey]	[Light Grey]	Transportation
[Dark Grey]	[Dark Grey]	Township
[Hatched]	[Hatched]	Defense Area / Military Zone
[Light Green]	[Light Green]	Recreational/ Green Buffer/ NDZ



Scale - 1:14,000

Figure 12-45: Proposed Land Use - PD43 - Lumdiengnan

### 12.3.44 PLANNING DISTRICT NO.44 – LUMDIENGSAI

**Area:** 1541.20Hectares

**Location:** Peripheral Area

**Major Landmarks:** View point, New Shillong Township, Lumdiengsai (Figure 12-46).

Table 12-46: Proposed Landuse-PD44-Lumdiengsai

SNo	Categories	Area(Ha)	%age
1	Residential	218.59	14.19
2	Commercial	51.55	3.35
3	Mixed	60.47	3.92
4	Industrial	2.37	0.15
5	Public & Semi public	389.58	25.28
6	Public Utilities	1.41	0.09
7	Transportation	43.62	2.83
8	Township	444.09	28.82
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	74.79	4.85
11	Agriculture & Allied Activities	113.06	7.34
12	Water Sheet	8.03	0.52
13	Forest Area	0.00	0.00
14	Hazards Prone Area	133.22	8.65
<b>Grand Total</b>		<b>1541.20</b>	<b>100</b>

#### General Description about the Proposed Land Use in planning district:

The predominant land use categories in Lumdiengsai is Township, which covers 28.82% of the total area (Table 12-46).

The major proposed land uses include Residential area of 218.59 Ha (Existing: 10.18 Ha), Recreational/ Green Buffer/ NDZ of 74.79 Ha (Existing: 45.49 Ha) and Transportation of 43.62Ha (Existing-41.91 Ha) in the planning district contributing 14.19%, 4.85% and 2.83% respectively. Additionally, an area of 20.27 Ha has been proposed for Commercial and 13.76Ha for mixed use, thus making it to a total of 51.55 Ha and 60.47 Ha.

The other proposed land uses are Public & Semi-public (389.58 Ha), Public Utilities (1.41 Ha) and Industrial (2.37 Ha).

In the township area, the permission are subject to the authority and decision taken by the authority in this regard shall be final.

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
PLANNING DISTRICTS - 44 - LUMDIENGSAI

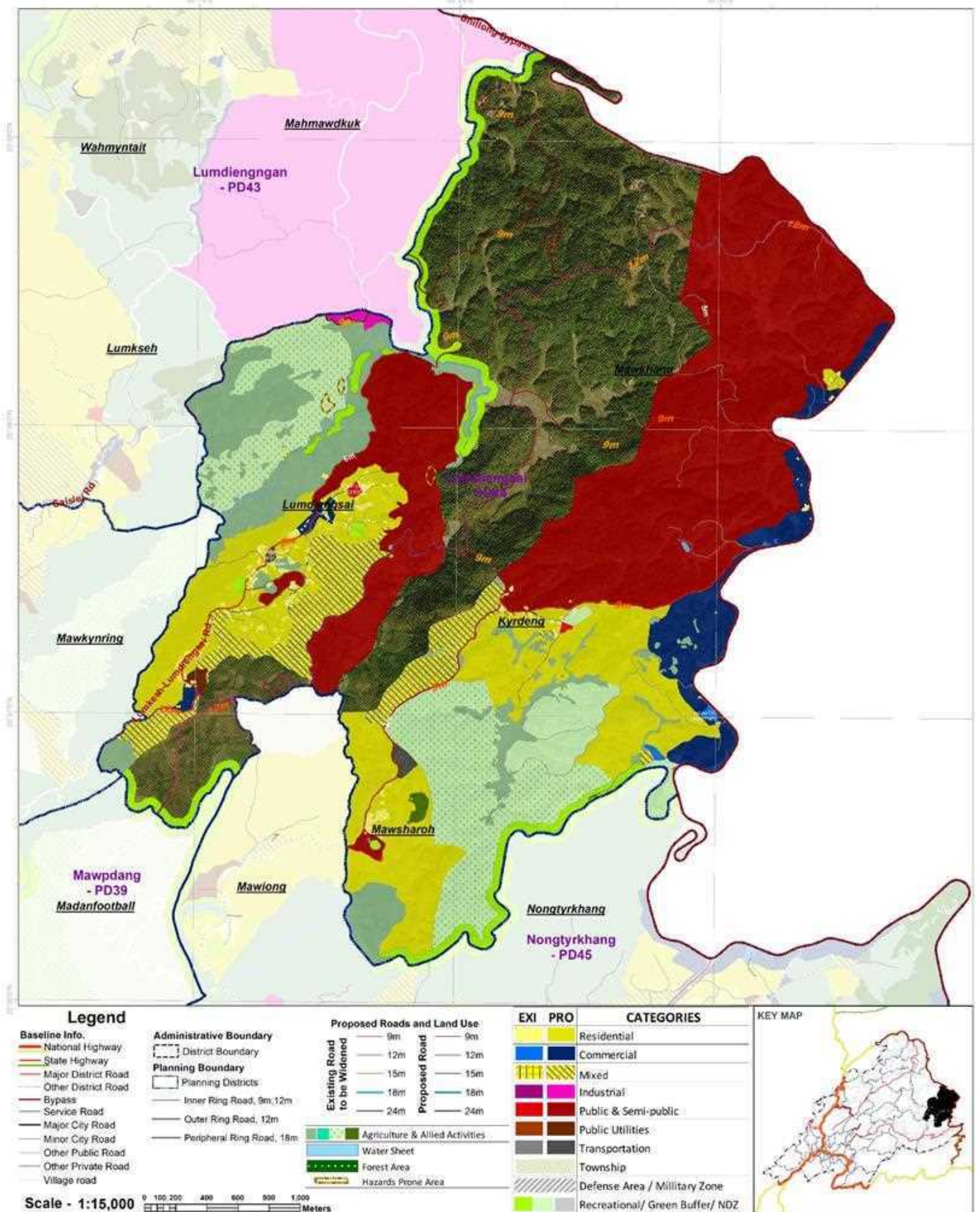
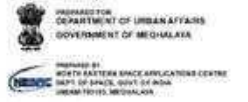


Figure 12-46: Proposed Land Use - PD44 - Lumdiengsai

### 12.3.45 PLANNING DISTRICT NO.45 –NONGTYRKHANG

**Area:** 1661.53Hectares

**Location:** Peripheral Area

**Major Landmarks:** Mawiong, Ummir, Nongbareh Lyntiar, Jhazubi Point (*Figure 12-47*).

Table 12-47: Proposed Landuse-PD45-Nongtyrkhang

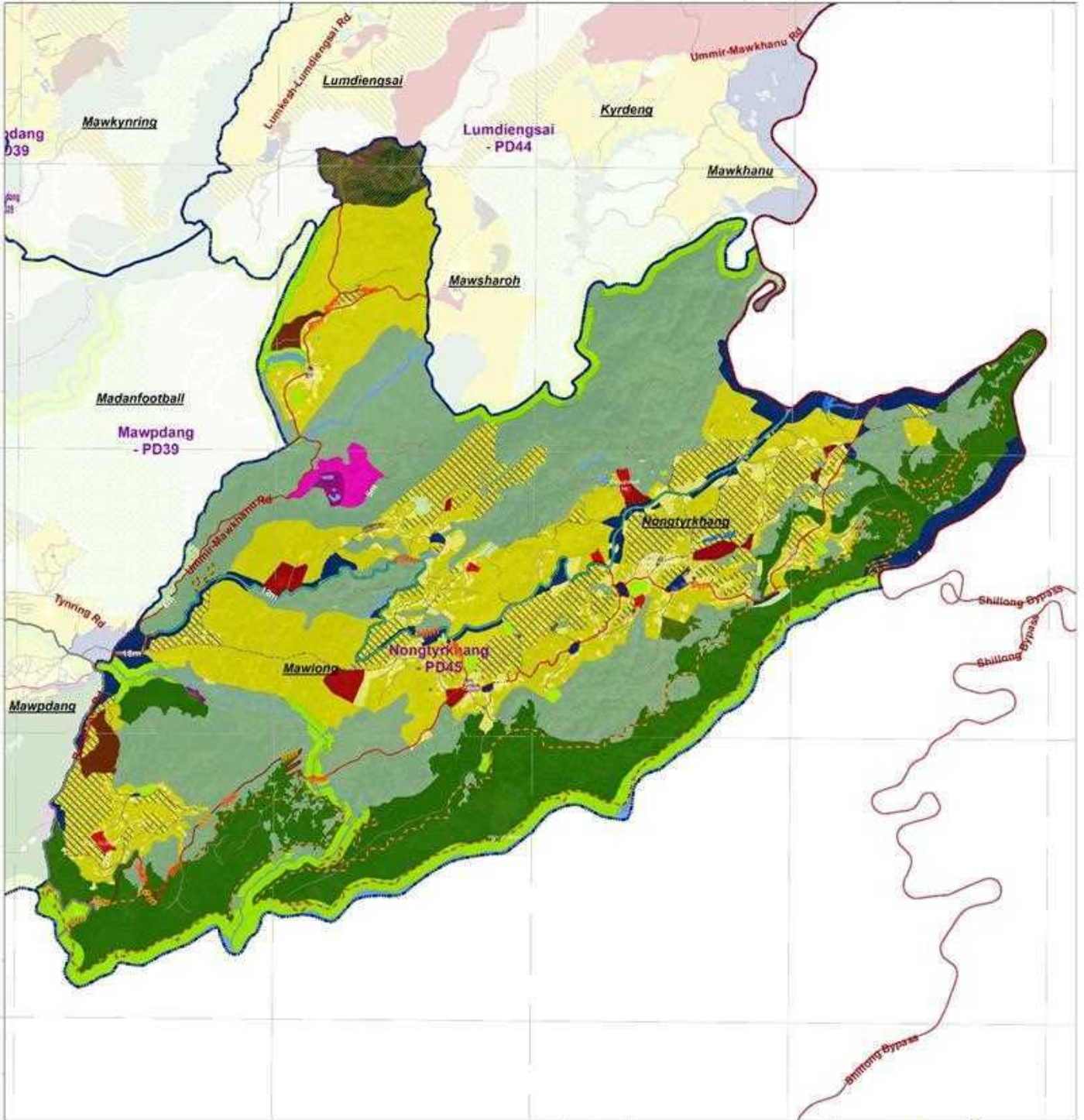
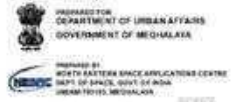
SNo	Categories	Area(Ha)	%age
1	Residential	385.77	23.22
2	Commercial	51.42	3.10
3	Mixed	134.49	8.10
4	Industrial	12.45	0.75
5	Public & Semi public	18.59	1.12
6	Public Utilities	10.00	0.60
7	Transportation	56.82	3.42
8	Township	22.45	1.35
9	Defense Area / Military Zone	0.00	0.00
10	Recreational/ Green Buffer/ NDZ	112.36	6.76
11	Agriculture & Allied Activities	826.34	49.74
12	Water Sheet	27.11	1.63
13	Forest Area	0.00	0.00
14	Hazards Prone Area	3.43	0.21
<b>Grand Total</b>		<b>1661.52</b>	<b>100</b>

#### General Description about the Proposed Land Use in planning district:

The major proposed land uses include residential area of 385.77 Ha (Existing: 56.5 Ha) and commercial area of 51.42 Ha (Existing: 1.5 Ha) in the planning district contributing 23.22% and 3.1% respectively. However, agriculture and allied activities contribute maximum at 49.74%. Additionally, an area of 9.6 Ha has been proposed for industries, thus making it to 12.45Ha. The other proposed Land uses are Mixed (134.49 Ha), Public & semi-public (18.59Ha), Public utilities (10Ha), Recreational/ Green Buffer/ NDZ (112.36 Ha), and Transportation (56.82 Ha) (*Table 12-47*).

In the township area, the permission are subject to the authority and decision taken by the authority in this regard shall be final.

FORMULATION OF GIS BASED MASTER PLAN FOR SHILLONG PLANNING AREA  
**PLANNING DISTRICTS - 45 - NONGTYRKHANG**

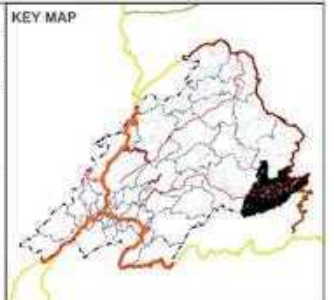


**Legend**

- Baseline Info:**
- National Highway
  - State Highway
  - Major District Road
  - Other District Road
  - Bypass
  - Service Road
  - Major City Road
  - Minor City Road
  - Other Public Road
  - Other Private Road
  - Village road
- Administrative Boundary**
- District Boundary
  - Planning Boundary
  - Planning Districts:
    - Inner Ring Road, 9m, 12m
    - Outer Ring Road, 12m
    - Peripheral Ring Road, 18m

- Proposed Roads and Land Use:**
- | Existing Road to be Widened | Proposed Road |
|-----------------------------|---------------|
| 9m                          | 9m            |
| 12m                         | 12m           |
| 15m                         | 15m           |
| 18m                         | 18m           |
| 24m                         | 24m           |
- Agriculture & Allied Activities
  - Water Sheet
  - Forest Area
  - Hazards Prone Area

EXI	PRO	CATEGORIES
[Yellow]	[Yellow]	Residential
[Blue]	[Blue]	Commercial
[Green]	[Green]	Mixed
[Red]	[Red]	Industrial
[Brown]	[Brown]	Public & Semi-public
[Grey]	[Grey]	Public Utilities
[Light Green]	[Light Green]	Transportation
[Diagonal Lines]	[Diagonal Lines]	Township
[Dark Green]	[Dark Green]	Defense Area / Military Zone
[Light Blue]	[Light Blue]	Recreational/ Green Buffer/ NDZ



Scale - 1:17,000 0 100 200 400 600 800 1,000 Meters

Figure 12-47: Proposed Land Use - PD45 - Nongtyrkhang

## 13 PHASING

The proposals contained in the master plan have been given different time horizon, considering phasing and implementation scheme. It is proposed to be implemented in two phases during the plan period from 2023-2041. The first phase will be taken up during 2023-2031 and the remaining phase will be taken up during the plan period 2032-2041.

Table 13-1: Phasing of Land Use & Infrastructure

Phasing	Area(Sq.km)	%age	Phasing Area(Sq.km)
1st Phase Developed Area	45.84	26.3%	174.21
1st Phase Phasing	57.24	32.9%	
2nd Phase Developed Area	5.52	4.8%	114.30
2nd Phase Phasing	67.18	58.8%	

The first phase would comprise of a total development of 174.21km<sup>2</sup> of the planning area. Within this jurisdiction around 45.84 km<sup>2</sup> of the area is developed, a total area of 57.24 km<sup>2</sup> would be taken up with respect to development of housing, transportation, power, water supply etc. (Table 13-1).

Simultaneously the second phase during the plan period 2032-41 would comprise development of another 67.18 km<sup>2</sup> of the total planning area.

The Figure 13-1 corresponding to phasing of infrastructure is being showcased to ease out the implementation process.

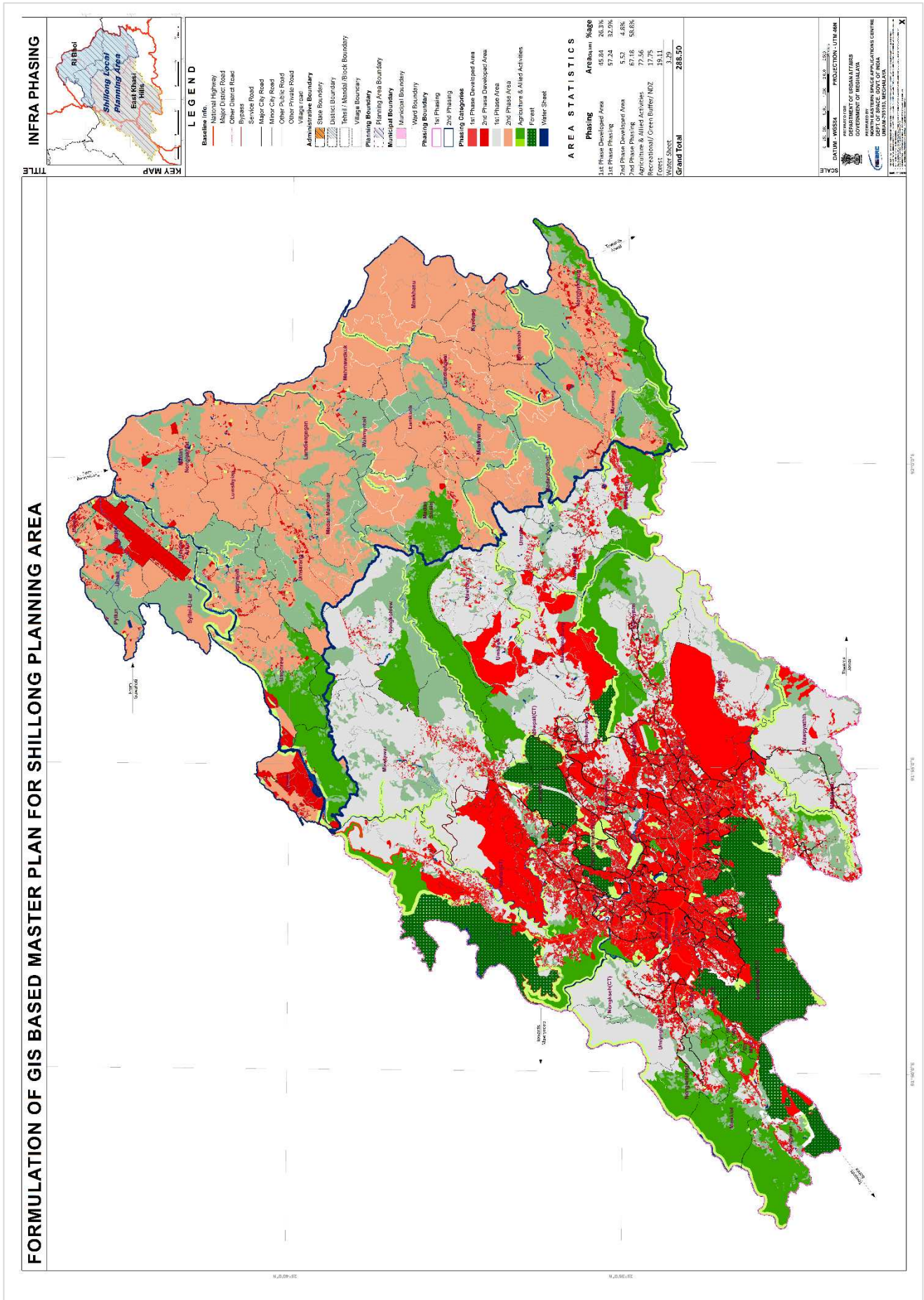


Figure 13-1: Phasing of Land Use & Infrastructure

## 14 PLAN IMPLEMENTATION & ENFORCEMENT

The preparations of master plans are ineffective towards improving the quality of city life in any way unless sustained efforts are made to enforce and implement the plan systematically. In building a city or a town, the major role is often played by the citizens, individually or collectively by undertaking construction and development of land for various uses.

Meghalaya urban development authority is mainly responsible for enforcement and implementation of the master plan as per the Meghalaya Town and Country planning act of 1973. The urban affairs department will provide necessary guidance by rendering technical advice and ensuring strict and proper scrutiny to ensure that the proposed plan will conform to the proposals contained in the approved master plan.

As mentioned above the Meghalaya Urban Development Authority will enforce and implement the plan but the Government Department like Public Health Engineering, Public Works Department, Health Department, Urban affairs department, Municipal board, Industry (MIDC) etc. will also undertake construction within their respective field of activity. Since Housing department/Housing Board is engaged in construction of Houses, it is envisaged that it will undertake schemes pertaining to Housing. This will add to the process of the implementation of the master plan. *Table 14-1* illustrates institutional arrangement for implementation of all the proposals based on the existing role and functions of the Department/Agency.

**Table 14-1: Sectoral Institutional Arrangement for Implementation of Proposals**

SNO	SECTOR	SECTORAL /DEPARTMENTAL ROLE	IMPLEMENTING AGENCY
1	Land Development	Development of Townships & allied infrastructures	The Meghalaya Urban development Authority will initiate action
		Acquisition and development of Land	
2	Housing	Housing Improvement and Up gradation	Housing Department /Housing Board
3	Transportation & related Infrastructure	Construction of New Roads	State Public Works Department/Central Public Works Department/NHIDCL
		Widening and metalling of Existing Roads	
		Improvement of Road junctions and intersections	
		Construction of parking spaces/lots	
		Construction of Bus stands/Bus stops/Bus bays	
		Construction of Logistics Hub	



4	Commercial	Development of Commerce and Commercial Activity places/centers	Meghalaya Urban development Authority
		Construction of Whole sale markets	
		Construction of Retails shopping places	
5	Power Supply	Augmentation of Existing Power supply networks	Meghalaya State Electricity Board/ Meghalaya Energy Corporation limited
		Extension of power supply to all developed areas of the master plan	
		Augmentation of power supply to all the rural areas of the master plan	
6	Water Supply	Augmentation of water supply within the existing town	Public Health engineering department
		Detailed feasibility study for water supply system in the new township	
7	Administration	Acquisition and development of Land for Administrative Uses	General Administrative Department
8	Drainage & Sewerage System	Construction of drainage and sewerage system in the existing town	Public Health engineering department
		Detailed feasibility study for sewerage system in the new township	
		Construction of Decentralised waste water treatment systems	
9	Recreational	Upgradation & maintenance of existing recreational areas	Forest Department
		Development of new recreational areas	
		Acquisition of land for development of parks	
10	Community Facilities	Construction of health centers/Hospitals	Health & Education department
		Construction of Schools & Colleges	
11	Industry	Development of New Industrial estates	Industry Department/ M.I.D C
12	Building Bylaws/Zoning Regulations	Enforcement of Zoning Regulations/Building Bylaws	Meghalaya Urban Development Authority

## 15 ZONING REGULATIONS

### 15.1 INTRODUCTION

In order to promote public health, safety and the general social welfare of the community, it is necessary to apply control and reasonable limitation on the development of land and buildings. This is to ensure that most appropriate, economical and healthy development of the town takes place in accordance with the land use plan and its continued maintenance over the years. For this purpose, the town is divided into a number of use zones, such as residential, commercial, industrial, public and semi-public etc. Each zone has its own regulations, as the same set of regulations cannot be applied to the entire town.

Zonal Regulations protect residential areas from the harmful invasions of commercial and industrial uses and at the same time promote the orderly development of industrial and commercial areas, by suitable regulations on spacing of buildings to provide adequate light, air, protection from fire, etc. It prevents overcrowding in buildings and on land to ensure adequate facilities and services.

Zoning is not retrospective. It does not prohibit the uses of land and buildings that are lawfully established prior to the coming into effect of these Zonal Regulations. If these uses are contrary to the newly proposed uses, they are termed non-conforming uses and are gradually eliminated over years without inflicting unreasonable hardship upon the property owner.

The Zonal Regulations and its enforcement ensure proper land use and development and form an integral part of the Master Plan. It also ensures solutions to problems of development under local conditions.

### 15.2 ESTABLISHMENT OF ZONES

The Zonal Regulations for Shillong Local Planning Area prepared under the section 12 of the Meghalaya Town and Country Planning Act, 1973 are detailed below,

The Local Planning Area, divided into three main planning zones based on the administrative boundaries i.e., Ward Boundary and Village Boundaries such as (*Figure15-1*),

- Core Area/Intensely Developed Area (Zone-A)
- Peri-Urban Area/ Moderately Developed Area (Zone-B)
- Peripheral Area/ Sparsely Developed Area (Zone-C)

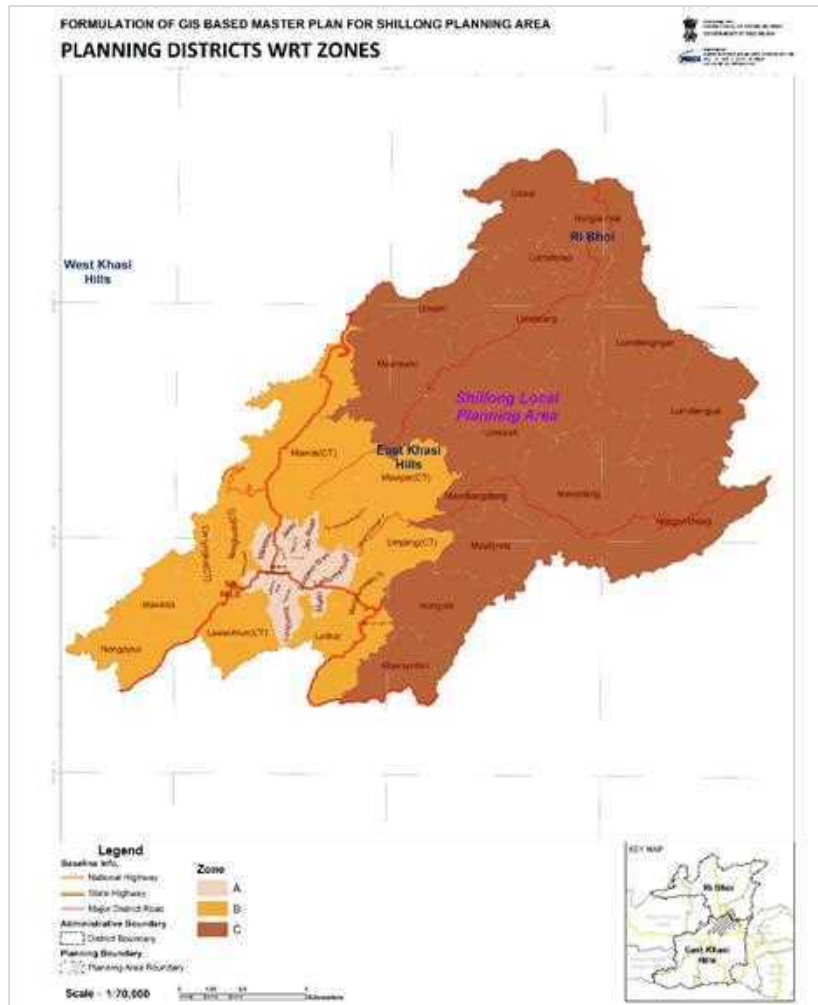


Figure 15-1: Planning Districts wrt Zones

### 15.3 ZONAL BOUNDARIES AND INTERPRETATIONS

- Where there is uncertainty as regards the boundary of the zones in the approved maps, it shall be referred to the authority and the decision of the authority in this regard shall be final.
- For any doubt that may arise in interpretation of the provisions of the Zonal Regulations, the Director of Town and country Planning shall be consulted by the authority.
- The planning perimeters such as area improvement perimeter, transport and utilities perimeter, etc. shown in SMP2041 refer to indicative areas in the city that need to be dealt with detailed action plans and they serve as mere informative tool on the Plans.
- Where there is uncertainty in identifying alignment of nala, canal, river, existing public road, high-tension line and any religious buildings position in the approved maps, it shall be referred to **the actual position on ground and decision taken by the authority in this regard shall be final.**

## 15.4 DEFINITIONS

In these Zonal Regulations, unless the context otherwise requires, the expressions given below shall have the meaning indicated against each of them.

**‘Act’** means Meghalaya Town and the Country Planning Act, 1973.

**‘Alteration’** means a change from one occupancy to another or a structural change or change of any component of the building.

**‘Agriculture’** includes horticulture, farming, growing of crops, fruits, vegetables, flowers, grass, fodder, trees of any kind or cultivation of soil, breeding and keeping of livestock including cattle, horses, donkeys, mules, pigs, fish, poultry and bees, the use of land which is ancillary to the farming of land or any purpose aforesaid but shall not include the use of any land attached to a building for the purpose of garden to be used along with such building; and ‘agriculture’ shall be construed accordingly.

**‘Amalgamation’** means clubbing of two or more authorized plots.

**‘Amenity’** includes roads, street, open spaces, parks, recreational grounds, playgrounds, gardens, water supply, electricity supply, street lighting, sewerage, drainage, public works and other utilities, services and conveniences.

**‘Apartment / multi dwelling units’** means a rule or suite or rooms, which are occupied or which is intended or designed to be occupied by one family for living purpose.

**‘Apartment building / multi dwelling units’** means a building containing four or more apartments / dwelling units, or two or more buildings, each containing two or more apartments with a total of four or more apartments / dwelling units for all such buildings and comprising or part of the property.

**‘Applicant’** means every person who writes to the Authority of his or her intention to erect, re-erect, or alter a building.

**‘Authority’** means the Meghalaya Urban Development Authority.

**‘Balcony’** means the horizontal projection of a building including handrail, balustrade or a parapet to serve a passage or a sit-out place.

**‘Basement(s)’** means the lower storey / floor(s) of a building, partly below the ground level. It shall be applicable only in flat terrain.

**‘Bifurcation’** means bifurcation of plot into two.

**'Building' includes;**

- a. A house, out-house, stable, privy, shed, well, verandah, fixed platform, plinth, door step and any other such structure whether of masonry, bricks, wood, mud, metal or any other material whatsoever;
- b. A structure on wheels simply resting on the ground without foundation;
- c. A ship, vessel, boat, tent and any other structure used for human habitation or used for keeping animals or storing any article or goods on land.

**'Building line'** means the line up to which the plinth of buildings may lawfully extend within the plot on a street or an extension of a street and includes the line prescribed, if any, or in the Master Plan or Town Planning Scheme. No portion of the building may extend beyond this line or the prescribed setback whichever is higher.

**'Building Set Back'** is the minimum distance between any building or structure from the boundary line of the plot.

**'Bus Terminal'** means a premises used by public transport agency to park the buses for short duration to serve the public. It may include the related facilities for passengers.

**'Chajja'** means a projection or horizontal structure overhang usually provided over opening of external walls to provide protection from sun and rain or for architectural consideration.

**'Chimney'** means an upright shaft containing one or more flues provided for the conveyance to the outer air of any product of combustion resulting from the operation of any heat producing appliance or equipment employing solid or gaseous fuel.

**'Clinic'** means a diagnostic centre where patients are examined and investigated for diagnosis and relevant advices are given for management but the patients are not admitted as indoor patients as in a hospital or nursing home. "Polyclinic" means an institution of a group of Doctors for examinations, diagnosis and advice to the patients belonging to various specialties in medicine. The basic difference of a Clinic from a hospital or a nursing home is that the patients are not kept in its premises for diagnostic or other therapeutic purposes as is done in a nursing home or hospital.

**'Commercial building'** means a building or part of a building, which is used as shops, and/or market for display and sale of merchandise either wholesale or retail, building used for transaction of business or the keeping of accounts, records for similar purpose; professional service facilities, corporate offices, software services, offices of commercial undertakings and companies petrol bunk, restaurants, lodges, nursing

homes, cinema theatres, multiplex, community hall (run on commercial basis), clubs run on commercial basis. Storage and service facilities incidental to the sale of merchandise and located in the same building shall be included under this group, except where exempted.

**‘Common wall’** means

- a. A wall built on land belonging to two adjoining owners, the wall being the joint property of both owners.
- b. If two adjoining owners build an abutting wall on their property, they are not common walls and no part of the footings of either wall shall project on to the land of the adjoining owner, except by legal agreement between the owners.
- c. Any such ‘common’ or abutting wall shall be considered for the purpose of these byelaws, as being equivalent to an external wall as far as the thickness and height are concerned.

**‘Community Hall’** means congregational place to be developed by Government of Local bodies, Trust, Society, etc., and having a hall without separate kitchen and dining. No upper floor shall be permitted.

**‘Convention Centre’** means premises having enclosed space for official meetings & discussions, cultural activities without cooking facilities.

**‘Corner plot’** means a plot facing two or more intersecting streets.

**‘Corridor’** means a common passage or circulation space including a common entrance hall.

**‘Courtyard’** means a space permanently open to the sky either interior or exterior of the building within the site around a structure.

**‘Covered Area’** means the area of any floor of a building, but does not include the space covered by:

- a. Compound wall, gate, slide/ swing door, open ramp, canopy, porch, pergolas, verandahs, balconies which are open on at least 3 sides and areas covered by chajja or similar projections and secondary / emergency / fire exit staircases which are uncovered and open at least on three sides and also open to sky.
- b. Drainage culvert, conduit, catch-pit, gully-pit, chamber, gutter and the like.
- c. Garden, rockery, well and well structures, plant nursery, water pool, swimming pool (if uncovered), platform round a tree, tank, fountain, bench, platform with open top and/or unenclosed on sides by walls and the like.
- d. Sentry sheds, transformer / sub- stations sheds.
- e. Access to the basement / lower ground floor / underground floor, if uncovered.

**Note:** Secondary / emergency / fire exit staircases: If more than 1 (one) such staircases are provided, then 1 (one) staircase with the highest area will be considered for the purpose of covered area.

**‘Density’** means concentration of population expressed in terms of number of persons per hectare in a particular area.

**‘Development’** with its grammatical variations- means the carrying out of building, engineering, mining or other operations in, or over or under land or the making of any material change in any building or land or in the use of any building or land and includes sub-division of any land.

**‘Development Plan’** Residential Development plan means proposal for construction of one or more buildings on a plot measuring more than 5,000 sqm in extent.

**‘Drain’** means a conduit, channel or pipe for carriage of storm water, sewage, wastewater or other water borne wastes in a building drainage system.

**‘Drainage’** means the removal of any liquid by a system constructed for this purpose.

**‘First floor’** means the floor immediately above the ground floor, on which second and other floors follow subsequently.

**‘Flatted factory’** means a premises having group of non-hazardous small industrial units as given in Schedule-I and II having not more than 50 workers and these units are located in multi-storeyed buildings.

**‘Floor’** means the lower surface in a storey on which one normally walks in a building. The general term ‘floor’ does not refer basement or cellar floor and mezzanine.

**‘Footing’** means the projecting courses at the base of a wall to spread the weight over a large area.

**‘Foundation’** means that part of structure, which is below the lowest floor, which provides support for the superstructure, and which transmits the load of the superstructure to the bearing strata.

**‘Floor Area Ratio’ (FAR)** means the obtained by dividing the total covered area of all floors by the area of a plot, i.e.

$$\text{Floor Area Ratio} = \frac{\text{Total covered area of all the floors}}{\text{Plot Area}}$$

**‘Garage’** means a structure designed or used for the parking of vehicles.

**‘Government’** means the Government of Meghalaya.

**‘Ground floor’** means the floor from where the main entrance to the building is taken with reference to the primary road / footpath adjacent to the plot. The Floor(s) beneath the ground floor shall be termed as ‘basement(s) / lower ground floor(s) / cellar(s) / underground floor(s)’ etc., as the case may be.

**‘Gas Godown’** means premises where LPG cylinders are stored.

**‘Ground Level’** means the surface(s) after formation cutting of the site from where the plinth of the building starts. In case of sloping site there may be 2 (two) or more such levels.

**‘Guest House or lodge’** means a building or a part of a building comprising not more than 10 (ten) rooms in all used for the purpose of boarding of persons with or without meal which shall include lodging dormitories.

**‘Hotel’** means a building or a part of the building comprising of more than 10 (ten) rooms and used for the purpose of boarding of persons with or without meal.

**‘Home Stay’** means a part of a building comprising of not more than 5 rooms in all used for the purpose of boarding for tourists with or without meal.

**‘Habitable floor/room’** means a floor/room of minimum height 3.0 metres occupied or designed for occupancy by one or more persons either for study, living, sleeping, eating, cooking, working but not including bathrooms, water closet compartments, laundries, serving & store pantries, corridors, cellars, attics, household, storage spaces etc., and space that are not used frequently or during extended period.

**‘Heavy industry’** means an industry employing more than 500 workers.

**‘Height of Building’** means the vertical distance(s) measured from the plinth(s) of the building to the terrace of the last floor of the building in the case of flat roofs; and in the case of pitched roofs, up to the point where the external surface of the outer wall intersects the finished surface of the sloping roof; and in the case of gables facing the road, the mid-point between the eaves level and the ridge.

Architectural features serving no other function except that of decoration or requirement as per architectural design for e.g. roof of churches, steeples / bell-tower / turrets / spires / domes, sloping roofs, etc., shall be excluded for the purpose of measuring heights. However, where an attic is proposed within the roof, the height of the roof shall be reckoned for the purpose of building height.

**‘High-rise Building’** means a building with ground floor plus four or more floors above the ground floor or a building exceeding 15 m in height.

**‘Hospital’** is a premise providing medical facilities of general or specialized nature for treatment for in and out patients.

**‘Industrial building’** means a building wholly or partly used as a factory, for the manufacture of products of all kinds including fabrication and assembly, power plant, refinery, gas plant distillery, brewery, dairy, factory, workshop etc.



**‘Junk Yard’** means premises for covered semi covered or open storage including sale and purchase of waste goods, commodities and materials.

**‘Land use’** includes the purpose to which the site or part of the site or the building or part of the building is in use or permitted to be used by the Authority. Land use includes zoning of land use as stipulated in the Master plan and the Zoning Regulations.

**‘License’** means a permission or authorization in writing by the Authority to carry out work regulated by the Zoning Regulations.

**‘Light industry’** means an industry employing not more than 50 workers with power or without power, aggregate installed power not exceeding 25 HP, not causing excessive, injurious or obnoxious fumes, odor, dust, effluent or other objectionable conditions.

**‘Master Plan’** means Master Plan prepared for the Local Planning Area of Shillong Town approved by the Government under the Meghalaya Town and Country Planning Act, 1973.

**‘Medium industry’** medium industry, which employs not more than 500 workers.

**‘Multilevel Car parking (MLCP)’** means a building or structure designed specifically for the purpose of automobile parking having more than one floors or levels on which parking takes place by means of either static, automated or mechanical process comprising in the same building or structure, fully or in a part of it or any other independent structures like deck, steel frame, floors of the building or the structure as the case may be.

**‘Multiplex Complex’** means, Means the Cinema halls existing along with other activities like shopping mall, cafeteria, restaurant etc., in one campus with not less than 2 separate cinema screens in two different halls under the same complex having seating capacity as prescribed by the Government.

**‘Mezzanine floor’** means an intermediate floor between any two floors above ground floor in all types of buildings, provided the same is counted as part of total permissible floor area ratio and height of the building. Mezzanine floor may be permitted with the maximum height of 2.40m and a maximum area of 1/3<sup>rd</sup> the floor area of that particular floor.

**‘Open space’** means an area forming an integral part of the plot, left open to sky in a building.

**‘Owner’** means a person who receives the rent for use of land or building, or would be entitled to do so if they were let.

**'Parapet'** means a low wall or railing built along the edge of a roof or floor not less than 90cm in height.

**'Parking space'** means an area enclosed or unenclosed, covered or open sufficient in size to park vehicles together with a drive-way connecting the parking space with a street or any public area and permitting the ingress and egress of the vehicles.

**'Plinth'** means the portion of a structure between the surface of the surrounding ground and surface of the floor immediately above the ground.

**'Plot or site'** a parcel (piece) of land enclosed by definite boundaries.

**'Plot Coverage'** means the quotient obtained in terms of percentage, by dividing the area of a floor having maximum covered area by plot area, i.e.

$$\text{Plot Coverage (PC)} = \frac{\text{Area of a floor having maximum covered area} \times 100}{\text{Plot Area}}$$

**'Public and semi-public building'** means a building used or intended to be used either ordinarily or occasionally by the public which are defined as per the AMRUT Design and Standards.

**'Residential building'** means a building used or constructed or adopted to be used wholly for human habitation and includes garages, and other out-houses necessary for the normal use of the building as a residence.

**'Restaurant'** is a premises used for serving food items on commercial basis including cooking facilities, with covered or open space or both having seating facilities.

**'Retail Shop'** is a premise for sale of commodities directly to the consumer with necessary storage.

**'Road level'** is the level of the road at the access to the property or in the event of more than one entrance to the property the road level considered shall be at the Centre of the property frontage. The level of the road shall be taken at the Centre of the carriageway.

**'Room height'** means the vertical distance measured between the finished floor surface and the finished ceiling surface. Where a finished ceiling not provided, the underside of the joists or beams or tie beams shall determine the upper point of measurement. The minimum height of the room shall be 2.75M.

**'Registered architect/engineer/ Firm, etc.'** means a qualified Architect / Engineer / Firm, etc., who have been given registration by the Authority.

**'Service Apartments'** means a premise in which rooms are let out on short term basis.

**‘Service Road’** means a road / lane provided at the front, rear or side of a plot for service purposes.

**‘Set back’** means the open space from the proposed building to the plot boundaries and laid down in each case by the Authority.

**‘Special Building’** – These are:

- a. Hotel, commercial, industrial, storage, hazardous and mixed occupancies, where any of these buildings have covered area more than 500 sqm;
- b. Educational / institutional/ public & semi-public buildings having 9m height or more with covered area more than 500 sqm;
- c. All assembly buildings with covered area more than 500 sqm;
- d. Buildings with basements/ lower ground floor/ Cellar/ underground floor with covered area more than 500 sqm.
- e. Buildings, having area more than 300 sqm of incidental assembly occupancy on any floor.

**‘Special Projects’** means those projects / buildings with large scale activities such as Hotels, Public Institutions, Healthcare, Shopping Malls, Multiplexes, ICT / BPO’s, Educational Institution having a minimum plot area of 50,000 sqft and a minimum single covered area of 40% of the plot area.

**‘Storey’** means the portion of building included between the surface of any floor and the surface of the floor next above it.

**‘To abut’** in relation to the building or any portion of it means to touch the road boundary or the adjoining plot or building.

**‘To erect’** means

- a. To erect a new building on any site whether previously built upon or not;
- b. To re-erect any building of which portion have been dismantled, burnt or destroyed;
- c. Conversion from one occupancy to another; and
- d. To carry out alterations.

**‘Water closet’** means a privy with arrangements for flushing the pan with water but does not include a bathing room.

**Note:** The words and expressions not defined in these regulations shall have the same meaning as in the Meghalaya Town and Country Planning Act, 1973, MBBL-2021, AMRUT Design and Standards and National Building Code of India, 2016.

Only definitions are given above. For regulations, the relevant chapters of the Zoning regulations may be referred.

## 15.5 LIST OF LAND USE CATEGORIES PERMISSIBLE IN VARIOUS ZONES

For the purpose of these regulations, the planning area of the town is categorized into following use zones.

1. Residential(R)
2. Commercial(C)
3. Industrial (I)
4. Public and Semi-Public (PSP)
5. Mixed Use (M)
6. Public Utilities (PU)
8. Recreational (P)
9. Transportation and Communication (T)
10. Agricultural Use (A)
11. Protective & Undevelopable Use Zone (E)
12. Unclassified (UC)

Uses of land that are permitted and those that may be permitted under special circumstances by the Planning Authority in different zones of the local planning area shall be as follows. Consolidated matrix is as shown in *Table 15-18*.

**Note:** All uses permitted under special circumstances shall be considered only after placing the subject before the authority.

### 15.5.1 RESIDENTIAL ZONE(R)

#### 15.5.1.1 USES PERMITTED

Table 15-1: Permissible Land uses in Residential Category

1	Residence – plotted, (detached, semi-detached and row housing) Group housing, Residential flat.
2	Dharmashala old age homes, Orphanages
3	Hostels/Paying Guest House Accommodation
4	Public libraries, Post and Telegraph offices, Telephone exchange
5	Solar Generation units, Milk booths, STD booths
6	Mobile phone service repairs, computer institutes
7	Vegetable and fruits shops, bakery, shops for daily consumable
8	Medical Shop, Flour Mill, Tailoring Shop, Hair Cutting Saloon

9	Doctors consulting room when the applicant is the owner with an area not exceeding 20.00 sqm in the main building
10	Auto stands, ATMs, Bus shelters
11	Parking areas and Multi-level car parking as part of residential apartments to cater the needs of residents only

#### 15.5.1.2 USES THAT ARE PERMITTED UNDER SPECIAL CIRCUMSTANCES BY THE AUTHORITY

- No commercial activity of whatsoever nature shall be allowed in residential land use zone in Planning Zone A and Planning Zone B if the road width is less than 6mtr.
- Schools offering up to higher primary schools (space standards as prescribed by competent authority) philanthropic uses.
- Fuel storage depots, filling stations, service industries with power up to 5-10 HP (for all the industries and those as per the list given in Schedule-I, power required for air conditioning, lifts and computers are excluded from HP specified)
- Gas cylinder storage provided it satisfy all required norms of safety, neighbourhood or convenience shops limited to 20.00 sqm.
- Hard and software computer offices and information technology related activities provided the site is abutting a road of minimum 9mtr width,
- Chat / café centres, doctors consulting room, office of advocates, and other profession in public interest not exceeding 20.00 sqm provided the applicant himself is a professional, pay & use toilets.

**Note:** Diesel generators equivalent to the quantity of power supplied by the MePDCL may be permitted as substitute to power cut and power failures in any zone after obtaining information on the quantity of power supplied to a premises and the capacity of generator required from MePDCL. However, in residential zone installation of diesel generators be discouraged and shall be given in exceptional cases after spot verification and obtaining No Objection Certificate from the people living within a distance of 100 m from the location point of generator.

## 15.5.2 COMMERCIAL ZONE(C)

The Commercial Land Use Zone has been further divided into five (5) categories and the uses/ activities permitted under each of these categories are given in Table below.

### 15.5.2.1 USES PERMITTED

Table 15-2: Permissible Land uses in Commercial Category

<b>Commercial - 1</b>	
1	Petty shops, Newspaper, stationery and milk booth, vulcanizing shops
2	Tutorial centres not exceeding 50 sqm
3	STD/ FAX/internet centre/ ATM centres
4	Hair dressing and beauty parlours
5	Offices/ clinics belonging to "Professional services" category and self-owned not exceeding 25 sqm
6	Tailoring, dry cleaners
7	Bakery and sweetmeat shop
8	Power Looms of upto 2HP and Flour Mills upto 5HP
9	Pathological labs.
<b>Commercial - 2</b>	
1	Eateries such as tea stall, and takeaways
2	Gyms, orphanages, old age homes, clinics
3	Retail shops , hardware shops
4	Mutton and poultry stalls.
5	Job typing, cyber café & internet browsing
6	Uses for small repair centres- electronic, mechanical , automobile, etc.
7	Banks, ATMS, insurance and consulting and business offices
8	Photo Studio
9	Nursing homes and polyclinics/ dispensaries /labs subject to minimum 300sq.m plot size and NOC from pollution control board after adequate parking facility is provided.
10	Fuel stations and pumps, LPG storage
11	All the uses of C1 are permitted
<b>Commercial - 3</b>	
1	Commercial and corporate offices
2	Retail Shopping complexes, computer training institutes
3	Restaurants and Hotels
4	Convention centres and banquet halls
5	Financial institutions

6	Cinema and multiplexes
7	Education Coaching Centres
8	Places of assembly, exhibitions centres
9	Gas Retail Outlets
10	Power Looms and Flour Mills upto 10 HP
11	Entertainment and amusement centres
12	Hospitals and specialty hospitals
13	Automobile repair and garage centres , spares and stores
14	All uses of C1 & C2 are permitted
<b>Commercial - 4</b>	
1	Sale of second hand junk goods , junk yards
2	Warehouses and storage areas for goods
3	Whole sale and trading
4	All uses of C1, C2 & C3 are permitted
<b>Commercial - 5</b>	
1	Wholesale and warehouses -business
2	Agro Mandi's
3	Heavy goods markets
4	All uses of C1, C2, C3 & C4 are permitted

#### 15.5.2.2 USES THAT ARE PERMITTED UNDER SPECIAL CIRCUMSTANCES BY THE AUTHORITY

Automobile workshop, manufacturing establishments employing not more than ten workers and uses permitted or permissible on appeal in the residential zone other than those specifically prohibited therein. Heavy goods markets, storage of inflammable materials, sale of second hand junk goods, junk yards & agro marketing, junkyard, truck terminals, weigh bridges, cold storage, fruit and vegetable markets, meat and fish markets, wholesale business, trading & warehouses, flour mill up to 20 HP, for all the industries and those as per the list given in Schedule-I.

**Note:** Commercial complexes / office complexes/ neighbourhood shops should have sufficient provision for toilet for visitors in each floor and should be shown on plan. It shall have waste disposal arrangements and parking.

#### 15.5.3 INDUSTRIAL ZONE (I)

The Industrial Use Zone can be subdivided into

- Service and Light Industry: **I1** and
- Medium Industry: **I2**

### 15.5.3.1 USES THAT ARE PERMITTED

All industries and related subject to clearance from Meghalaya State Pollution Control Board, Covered storage for industry, public utilities and related buildings (parking, loading and unloading requirements to be approved for all uses), dairy and poultry farms, Information Technology & Bio Technology industries. Bus and truck terminals, petrol filling stations, taxi and scooter stands, canteen, all uses permissible in the commercial use zone except residential uses, and recreational facilities for employees, dwellings for manager's essential staff like foreman and watch and ward area not exceeding of 240.0 sqm or 10% of the total area whichever is less.

Table 15-3: Permissible land uses in Industrial Uses Category

<b>INDUSTRIAL - 1</b>	
1	Tiny and household industries*
2	R & D labs , Test centres , IT, BT , BPO activities
*Above Uses are permitted subject to condition that the zone permits the extent of area and the power consumption does not exceed 5 KW, the activity follows the required space standard, performance characteristics such as Noise, Vibration, Dust, Odour, Effluent, General nuisance.	
<b>INDUSTRIAL - 2</b>	
1	Warehousing, loading and unloading platforms to be provided
Above Uses permitted subject to condition that the zone permits the extent of the area and installed power and performance characteristics such as Noise, Vibration, Dust, Odour, Effluent, General nuisance are to be considered.	

### 15.5.3.2 USES PERMITTED UNDER SPECIAL CIRCUMSTANCES BY THE AUTHORITY

Obnoxious and hazardous industries are subject to clearance from the State Pollution Control Board, junk yards, dairy and poultry farms, slaughter house and meat processing unit, ice and freezing plants with power, sports and recreation uses, resorts and amusement parks.

**Note:**

- All medium industries are to be cleared by the Pollution Control Board.
- To encourage work-home relationship, 30% of the available land area for development of residential use for providing quarters to the employees of that particular industry, subject to clearance from the SPCB in an area of 10 hectares and above.
- Industry permitted is subject to performance characteristics Viz. air, water and noise pollution, vibration and sound pollution, dust, odour, effluent and general nuisance.



- Wherever IT and BT industries are permitted in an area of 5 hectares and above, 10% of the area may be allowed for residential apartment for the convenience of the employees subject to clearance from the SPCB.
- Residential regulations shall be followed for approval of residential development within the premises of industrial/I.T. and B.T. area.
- Uses permitted under this category are subject to environmental clearances.

### SCHEDULE – I

Table 15-4: Illustrative list of service and light industries permitted in Residential and Commercial Zone

SNo	DESCRIPTION
1	Bread and bakeries
2	Confectionary, candies and sweets
3	Biscuit Making
4	Ice, ice-Cream
5	Cold Storage (small scale)
6	Aerated water and fruit beverages
7	Huller and flour Mills
8	Automobile, scooter and cycle service and repair workshop
9	Furniture (Wooden and Steel)
10	Printing, book binding, embossing, etc.
11	Laundry, dry Cleaning and dyeing facilities
12	General jobbing and machine shops
13	Household utensil repairs, welding, soldering, patching and polishing.
14	Photography, printing (including sign board printing)
15	Vulcanizing
16	Tailoring
17	Hand looms
18	Velvet embroidery shops
19	Art weavers, printing and batik works
20	Jewellery, gold ornaments and silver wares
21	Mirror and photo frames
22	Umbrella assembly
23	Bamboo and cane products
24	Sport goods and repair shops

SNo	DESCRIPTION
25	Musical instrument repair shops
26	Optical lens grinding, watch, pen repairs
27	Radio and T.V. repair shops
28	Electric lamp fittings
29	Shoe making and repairs
30	Audio / Video libraries
31	STD / ISD counters
32	R&D Labs, test centres, IT, BT, BPO activities
33	Rubber stamps
34	Card board box and paper products including paper (manual only)
35	Cotton and silk printing/ screen printing
36	Webbing (narrow, fabrics, embroidery, lace manufacturing)
37	Ivory, wood carving and small stone carving
38	Coffee curing units
39	Candles and wax products
40	Household kitchen appliances
41	Washing soaps small scale only
42	Fruit canning and preservation
43	Electric lamp fitting / Assembly of Bakelite switches, shoe making, repairing
44	Power looms (reeling unit up to 10 HP)
45	Areca nut processing unit
46	Beedi rolling
47	Agarbathi rolling
48	Assembly and repair of measuring instruments(excluding handling of mercury and hazardous materials)
49	Clay & modelling with plaster of Paris
50	Dairy products Example: cream, ghee, paneer, etc.
51	Enamelling vitreous (without use of coal)
52	Milk cream separation
53	Photo copying of drawings including enlargement of drawings and designs
54	Packaging of shampoos
55	Packaging of hair oil
56	Utensil washing powder (only mixing and packaging)

## 15.5.4 PUBLIC AND SEMI-PUBLIC USES (PSP)

### 15.5.4.1 USES PERMITTED

All Central, State and Semi Government offices and centres and institutional office, educational, college campus including hostel facilities for students, cultural and religious institutions including libraries, reading rooms and clubs, medical and health institutions, cultural institutions like community halls, opera houses of predominantly non-commercial nature, utilities and services, water supply installations including disposal works, electric power plants, high tension and low tension transmission lines, sub stations, gas installation and gas works, firefighting stations, filling stations, banks, and quarters for essential staff and all uses permitted under parks and playgrounds.

Table 15-5: Permissible land uses in Public and Semi Public Category

<b>Public and Semi-public - 1</b>	
1	Sub offices of utilities and amenities up to 50 sqm
2	Public Library
3	Tot lots/Nursery, Crèches, Play Schools, Nursery Schools
4	Public distribution system shops
<b>Public and Semi-public - 2</b>	
1	Police Stations, Post offices
2	Primary School
3	Telecommunication/ microwave towers subject to necessary clearances from appropriate Authorities
4	Spastic Rehabilitation Centers, orphanages, Govt. dispensaries
5	Community Hall
6	Bill collection centers
7	Traffic and Transport related offices/ facilities
8	Exclusive places of worship, Dharmashala
9	All uses of PSP-1
<b>Public and Semi-public - 3</b>	
1	Parks, play grounds, Maidens' and stadiums (no area limit)
2	Nursing Homes and Hospitals
3	Middle schools, High schools, Secondary School, Integrated Residential Schools
4	Places of worship along with ancillary uses
5	Places of congregation
6	Research institutions
7	Government buildings, auditoriums, cultural complexes
8	Higher Educational Institutions, Colleges

9	Fire stations
10	Broadcasting and Transmission stations
11	Meteorological Observations

**Note:** Retail shops, restaurants, filling stations, clubs, banks, canteens, dwellings required for power maintenance and functioning of public and semi-public uses in the zone may be permitted when they are run on non-commercial basis in their own premises and ancillary to the respective institutions.

#### 15.5.4.2 USES THAT ARE PERMITTED UNDER SPECIAL CIRCUMSTANCES BY THE AUTHORITY

Parking lots, retail shops, parks, playgrounds and recreational uses, stadium, cemeteries, crematorium, clubs, canteen, libraries, aquarium, planetarium, museum, horticultural, nursery and swimming pool, orphanages and old age homes.

#### 15.5.5 MIXED USE (M)

Main features of 'Mixed Land Use' areas are those where employment, shopping and residential land uses will be integrated in a compact urban form, at higher development intensities and will be pedestrian-oriented and highly accessible by transit. Mixed-use areas will foster community interaction by providing focus on community facilities.

- Mixed uses are categorized as M1, M2, and M3 where M1 reference to Residential and Commercial where the design and development of mixed-use activity areas provide opportunities to create and/or maintain a special community identity and a focal point for a variety of citywide, community and neighbourhood functions. Mixed activity areas address the demand for employment, shopping and residential areas within the city.
- M1 and M2 (Residential and PSP) activities are allowed in all the zones, whereas M3 (Commercial and PSP) is limited to Zone 3.
- Mixed use permission are subject to the authority and decision taken by the authority in this regard shall be final.

#### 15.5.6 PUBLIC UTILITIES (PU)

##### 15.5.6.1 USES PERMITTED

Public utilities include energy, water, telecommunication sub stations/ service stations/supply and pumping stations, high and low tension transmission lines and power stations/ sub-stations, electric power plants, installations, storage reservoirs OHT, treatment plants, storage and dumping yards, gas godown and gas lines, gas installations and gas works, electric towers, transformers and microwave towers, telecom

towers and drainage and sanitary installations including solid waste management facilities such as land fill sites, garbage dumping yard, treatment plants and disposal works, drying beds, micro-wave towers, fire stations, milk dairies.

#### 15.5.6.2 USES THAT ARE PERMITTED UNDER SPECIAL CIRCUMSTANCES BY THE AUTHORITY

Shops, canteens, offices, banking counter, dwellings required for proper maintenance and functioning of public utility and other ancillary users, in their own premises as an ancillary to the respective institutions not exceeding 5% of the total area.

**Note:**

- *The buffer created for accommodating the utilities such as power, water, pipeline, oil pipelines and high voltage lines, gas lines and any other utilities. Each “buffer” is dictated by technical standards specified by the competent Authority.*
- *The Authority will decide the regulations for the above.*
- *In case of new developments, these shall remain as non-buildable areas and remain as reservations and marked for the purpose intended.*
- *For electrical networks, MePDCL standards are followed.*

#### 15.5.7 RECREATIONAL (P)

##### 15.5.7.1 USES PERMITTED

Parks, play grounds, stadia, N.M.T Infrastructural facilities, sports complexes, children’s play land inclusive of amusement parks such as Disney land type, toy trains, In-door recreational uses, parkways, boulevards, cemeteries and crematoria, burial grounds, public toilets, sewage treatment plants, water storage and treatment plants, public use ancillary to park and open space, parking, and playground. The area of such ancillary use shall not exceed 5% of total area.

##### 15.5.7.2 USES THAT ARE PERMITTED UNDER SPECIAL CIRCUMSTANCES BY THE AUTHORITY

Sports Clubs (non-commercial nature and run by residents’ association), canteens, libraries, milk booths, aquarium, planetarium, museum, art gallery, open air theatres, water sports and amusement theme parks, recreational clubs (Non commercial nature), public libraries, horticulture/nursery, garden land, transportation terminals and swimming pool, dwelling for watch & ward and uses ancillary to the above such as canteens, may be permitted not exceeding 5% of total area limited to ground plus one floor only.

## 15.5.8 TRANSPORTATION AND COMMUNICATION (T)

### 15.5.8.1 USES PERMITTED

Airport roads, road bays, auto stand, parking areas, multi-level car parking, kiosk Integrated, bus terminals, truck terminals, workshop and garages for two wheelers/LMV/HMV and filling stations, service stations, airports and helipad, post offices, telegraph offices, telephones and telephone exchanges, television telecasting and radio broadcasting stations, Transport offices, microwave stations and offices in their own premises and residential quarters for watch and ward, loading and unloading platforms (with/without cold storage facility), weigh bridges, cargo terminals and transfer of cargo between different types of transport (road, air), Automobile spares and services, transport depot, storage depots, bus stations, bus stands and bus shelter, commercial/office use shall be permitted in transit interchange terminals/ transit terminals up to 50 % of the permissible developable area.

### 15.5.8.2 USES THAT ARE PERMITTED UNDER SPECIAL CIRCUMSTANCES BY THE AUTHORITY

Hotels, motels, clubs, godown, special warehousing and indoor recreational uses, shops, canteens, restaurants, banks, dwellings required for proper maintenance of the transport and communication services in their own premises as an ancillary to the respective institutions not exceeding 25% of the total developable area.

#### **Note: In case of development around Rapid Transport System:**

- Station in the radius of 150 m from the boundary of the same an additional FAR of 0.5, over on Payment of fee at twice the applicable prescribed rates of betterment levy subject to statutory clearances e.g. Airport, Fire safety, Pollution control etc.,
- As far as possible, the traffic and transportation use should be located as per the envisaged activity. It is desirable to have truck terminal/ freight complex/ logistics hub next to or alongside the industrial use. Similarly, the public mass transit is meant to take on maximum number of repeat trips hence major terminals of passenger transit should be located at high-density work place and high density residential areas.

## 15.5.9 AGRICULTURAL USE (A)

### 15.5.9.1 USES PERMITTED

Agriculture and horticulture, children's play land, eco-tourism activities, dairy and poultry farming, Piggeries, Livestock, rearing pisciculture, Piggeries farms, livestock, rearing milk chilling centers, cold storage. Uses specifically shown as stated in the land use plan like brick kilns, mills, gardens, orchards, nurseries and other stable crops, grazing pastures, forest

lands, marshy land, barren land and water sheet, highway amenities viz., filling stations, weigh bridges and check posts.

#### 15.5.9.2 USES THAT ARE PERMITTED UNDER SPECIAL CIRCUMSTANCES BY THE AUTHORITY

Agro processing units, Urban amenities such as burial grounds, sports grounds, clubs/sports clubs, stadiums, playgrounds, parks and garden land, water sports, golf centres (when the land is more than 40 ha in extent then Golf course along with ancillary uses like administrative office, guest rooms/guest houses and dining facilities are permissible), race/driving testing tracks, cultural buildings, educational and health institutions, hospitals, libraries, places of worship, socio - spiritual/Meditation/Yoga centre air terminal and helipads, open spaces, graveyards/burial grounds, rehabilitated schemes of government, institutions relating to agriculture, research centres, LPG bottling plant (min. 500 m away from human habitation), warehouse for storage of agricultural products, storage and sale of farm products locally produced. Service and repairs of farm machinery and agricultural supplies, old age and orphanage homes, Public utilities such as solid waste landfills, water treatment plants, power plants, fuel stations and other highway amenities such as weigh bridges, check posts and toll gates having access to major roads, truck terminals, solar energy stations, residential developments within the area reserved for natural expansion of villages and buildings in such areas should not exceed two floors (G+1).

**Note:** The natural expansion of village is 50-100mtr from the outskirts existing residential area.

#### 15.5.10 PROTECTIVE & UNDEVELOPABLE USE ZONE (E)

The natural hazard prone areas identified under Master Plan 2041 were **structures, buildings and installations, that couldn't be avoided**; protective measures for such construction / development should be properly safeguarded based on the suggestion given in 15.6.19.

No building/ development activity shall be allowed in the bed of water bodies like nala, and in the Full Tank Level (FTL) of any lake, pond.

The above water bodies and courses shall be maintained as recreational/Green buffer zone, and no building activity other than recreational use shall be carried out.

The buffer zone defined by the Forest and Environment Department, Govt. of Meghalaya shall be reflected from the edge of these water bodies (Ref. No – FOR/CC/29/2019/Pt/688). As shown in following tables.

Table 1: SITING NORMS FOR BUILDINGS AND OTHER STRUCTURES FOR NON-RIVERINE WATERBODIES

Sl. No	Area of water body	Extent of Waterbody Setback	Parameters for Regulated Zone				
			Maximum Plot Coverage	Maximum F.A.R.	Maximum number of floors	Maximum building height	Type of building
1.	Up to 1ha.	10 m	40 %	1.00	2	7.6 m from any part of ground level	Residential
						8.2 m from any part of ground level	Non- Residential
2.	1 ha. to 500 ha.	20 m	40 %	1.00	2	7.6 m from any part of ground level	Residential
						8.2 m from any part of ground level	Non- Residential
3.	Above 500 ha.	50 m	40 %	1.00	2	7.6 m from any part of ground level	Residential
						8.2 m from any part of ground level	Non- Residential

Table 2: SITING NORMS FOR BUILDINGS AND OTHER STRUCTURES FOR RIVERINE WATERBODIES IN AREAS OTHER THAN URBAN AREAS

Sl. No.	Width of Riverine Waterbody	Size of Adjoining Plot	Extent of Waterbody Setback	Parameters for Regulated Zone				
				Maximum Plot Coverage	Maximum F.A.R.	Maximum Number of Floors	Maximum building height	Type of Building
1.	Up to 4m	Any size	10 m	50 %	1.00	2	7.6 m from any part of ground level	Residential
							8.2 m from any part of ground level	Non- Residential
2.	More than 4m	Up to 500 sqm	15 m	50 %	1.0	2	7.6 m from any part of ground level	Residential
							8.2 m from any part of ground level	Non- Residential
		500 -700 sqm	25 m	40 %	0.8	2	7.6 m from any part of ground level	Residential
							8.2 m from any part of ground level	Non- Residential
		Beyond 700 sqm	50 m	40 %	0.8	2	7.6 m from any part of ground level	Residential
							8.2 m from any part of ground level	Non- Residential

Table 4: SITING NORMS FOR BUILDINGS AND OTHER STRUCTURES FOR RIVERINE WATERBODIES IN URBAN AREAS

Sl. No.	Width of Riverine Waterbody	Extent of Waterbody Setback	Parameters for Regulated Zone				Type of Building
			Maximum Plot Coverage	Maximum F.A.R.	Maximum Number of Floors	Maximum building height	
1.	Up to 3 m	3m	As per the Meghalaya Building Bye-Laws, 2021				
2.	More than 3 m	6 m	As per the Meghalaya Building Bye-Laws, 2021				

The buffer zones of High-tension lines may differ w.r.t site conditions.

Protected area of the monument are governed by the policies that ASI follows or adopts, in the surrounding areas, particularly the prohibited (100mtrs) and regulated zone existing 300 mtrs beyond these buffers the monument shall be governed by the state norms.

Solid waste management, a buffer zone shall be followed along with the municipal norms

- a. Upto 50mtrs, No Development Zone except Greenery with tall rising trees only (Non-edible purposes),
- b. 50 - 100m, No Development Zone except SWM related infrastructure without superstructure.
- c. 100 - 200m, Infrastructure like STP water supply lines with proper encasing waste water pipelines, HTL power lines, LPG pipelines, Pump houses, Watch & ward of power stations, LPG Godown, etc.



### 15.5.11 UNCLASSIFIED (UC)

- Many of the areas on the planning district maps are under unclassified use and these include Defence. If any discrepancies are observed regarding the boundaries, land use and extent, the authority may take appropriate decisions. Any disputes shall be referred to the Government and the decision of the Government shall be final.
- In case, any private property is included within the boundary of unclassified zone and if the owner can establish that the ownership of land/ site vests with him/her, the land use adjoining the land/ site shall be assigned to the land in question that shall be decided by the Authority Only.

### 15.6 REGULATIONS APPLICABLE TO ALL ZONES

This shall be applicable in accordance with the Meghalaya Building Bye-Laws, 2021, and shall be subject to revision as necessary.

