Sustainable Urban Transport Project (India)

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MINISTRY OF URBAN DEVELOPMENT
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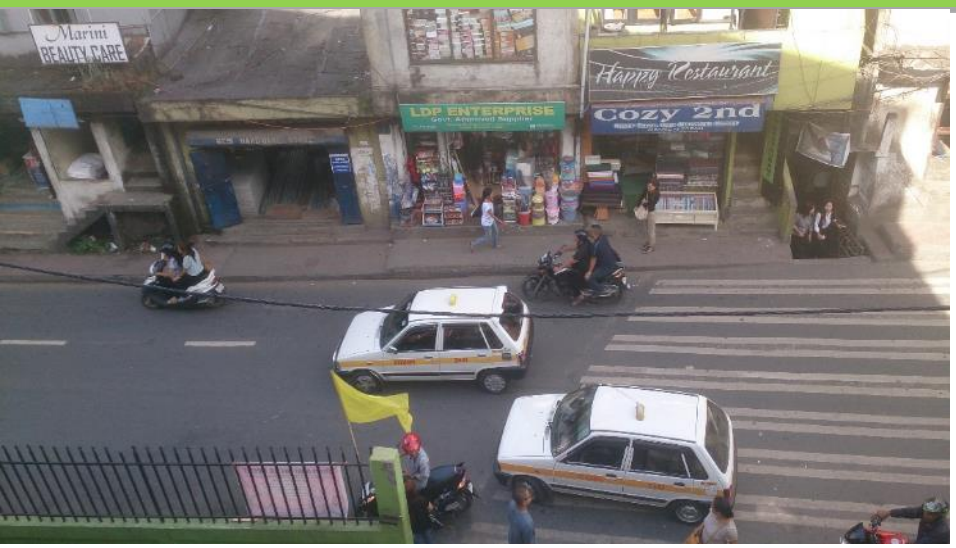
UNDP

AIZAWL NMT CITY SPECIFIC PLAN



CONSULTANCY SERVICES FOR DEVELOPING GUIDANCE DOCUMENTS FOR TRANSIT ORIENTED DEVELOPMENT (TOD), NON-MOTORISED TRANSPORT (NMT) AND PUBLIC BICYCLE SHARING (PBS)

May, 2016

NON-MOTORISED TRANSPORT

AIZAWL CITY SPECIFIC PLAN

Cover Page:

Images from Aizawl city | source: iTrans

Prepared for Ministry of Urban Development, Government of India

By IBI Group in association with iTrans

FOREWORD

Prior to the launch of the National Urban Renewal Mission (2005) and the National Urban Transport Policy (2006), investments in public transportation systems to meet the mobility needs of the current and future population were limited in Indian cities. Planning for essential city systems — environmental, land, mobility, economic and social — has largely been attempted in piecemeal manner. The need to induce a paradigm shift, putting people first in planning our regions, cities and neighbourhoods, implies providing for increased mobility choices from dependence on private vehicles to the availability of good public transportation and safe non-motorised transport.

Non-Motorised Transport (NMT) is a foundational mobility concept that prioritizes planning for walking and cycling over automobiles. This NMT City Specific Plan presents a compendium of strategies and recommendations for integrating accessibility with land use and infrastructure investment decisions in shaping NMT-friendly street designs. It follows the five-step planning process as prescribed in the NMT Guidance document for implementing non-motorised transport projects.

The document includes a comprehensive study on assessing the existing conditions in the context of preserving and encouraging the higher share of NMT usage in a hilly terrain, reviewing current institutional support, proposing development strategies and funding opportunities to facilitate implementation of prioritized non-motorised transport proposals. The plan also provides its stakeholders in Aizawl on the city specific planning process for NMT and equip them with essential tools and resources necessary to integrate NMT planning within the city's existing public infrastructure implementation framework.

It is of utmost importance that the local agencies integrate the NMT recommendations presented in this document to mainstream non-motorised transport planning in Aizawl. This will ensure that strategic investments in Aizawl lead to reducing emissions, increasing safety and sustainable urban environment for eastern India's emerging tier III city.

PREFACE

The Government of India (GoI) has initiated the Sustainable Urban Transport Project (SUTP) with the Ministry of Urban Development (MoUD) as the nodal agency and supported by the Global Environment Facility (GEF), World Bank and UNDP. SUTP consists of capacity building programmes and city demonstration projects, which aim to induce a major change in urban transport planning as currently undertaken in Indian cities.The primary objective of GEF-SUTP is to apply National Urban Transport Policy (2006) principles to achieve a paradigm shift in India's urban transport system for more favourable sustained developments and alternatives.

Under the guidance of MoUD, the project envisaged development of Guidance Documents for three sustainable development concepts: Transit Oriented Development (TOD), Non-Motorised Transport (NMT) and Public Bike Sharing (PBS) as essential steps towards achieving a comprehensive urban transport and land development planning process in the country. To further validate the findings and recommendations of the Guidance Documents, City Specific Plans (CSPs) for two selected demonstration cities each for the above mentioned concepts have been prepared. CSPs have also provided road map to the cities interested in applying these concepts. Lessons learned from these CSPs have helped contextualise the final Guidance Document(s) to Indian conditions.

The two NMT CSPs provide guidance for cities with: a) Hilly terrain to nurture a design sensitivity that respects the variations in topography and climate which could be replicated to cities with similar context; b) Integration of NMT with transit systems to improve the first and last mile connectivity. Ensuring that NMT infrastructure is in place as a support to existing or future public transit systems is crucial in developing compact communities and increasing transit ridership.

The Urban Development and Poverty Alleviation Department (UD&PA) applied for selection as a demonstration city for preparation of a City-specific NMT Plan. Aizawl, an example of tier III city in north-east India was selected as one of the demonstration cities. The city was prioritized to represent a city with hilly terrain with land constraints where NMT solutions, treatments and designs developed based on road geometries and slopes vary. Moreover, Aizawl lacks any planned high quality public transportation which makes it more dependent on walking as the dominant mode of travel which contributes to 39% of its modal share. Preparing an NMT city specific plan for Aizawl allowed an opportunity to address these challenges and prepare an action plan for other cities with similar terrain to follow. Furthermore, it will create opportunities for creation of compact walkable communities with a high degree of livability and affordability.

ACKNOWLEDGEMENT

The successful completion of this project required extensive involvement from the local nodal agency in Aizawl under guidance of Dr. C. Vanlalramsanga (Secretary, UD&PA, Aizawl).

The consultant team would like to thank the UDPA & AMC, specifically the staff that helped organize the meetings and guided the study process. In addition, IBI Group would also like to thank all stakeholders who attended the meetings and workshops, including

1. Shri PC Lalhmingthanga (Mayor, AMC)
2. Shri Ethel Rothangpuii, MCS (Secretary, AMC)
3. Shri Zosangzeki ChhakChhuah, (SMM, MIS & ME, NULM, UD&PA)
4. R.L. Zidivea, (Dpt. Director (Town Planning), UD&PA)

The consultant team for the preparation of the Aizawl NMT CSP was led by the following members from IBI Group:

- Dr. Anvita Arora (iTrans)
- Dr. Vijay Kovvali
- Mr. Bankim Kalra
- Ms. Zohra Mutabanna
- Ms. Astha Malhotra
- Mr. Parvesh Sharawat (iTrans)

EXECUTIVE SUMMARY

Introduction

The Ministry of Urban Development (MoUD), Government of India, under the Sustainable Urban Transport Project (SUTP), has appointed IBI Group in association with iTrans, to undertake the task of developing Guidance Documents and City Specific Plans for Transit Oriented Development (TOD), Non-Motorised Transportation (NMT), and Public Bicycle Sharing (PBS) for Indian cities. The Urban Development & Poverty Alleviation Department, Government of Mizoram, was the nodal agency for the project.

Aizawl was selected as one of the demonstration cities for NMT Planning where the five-step planning process recommended in the Guidance Document was applied to test its validity. The presence, quality and connectivity of Aizawl's NMT network varies significantly, and opportunities for improvements are evident throughout the city.

This Executive Summary highlights the research, analysis and stakeholder involvement activities that have been performed in the development of the NMT Plan; the resulting projects, programmes and policies that comprise the Plan; and the implementation strategy that will guide project and program activities.

The objective of this project was to develop a citywide plan for bicycle and pedestrian facilities and projects that addresses the mobility needs of different segments of the population – commuters, students, children, the disabled and the elderly. The Aizawl NMT Plan focuses on how bicycle and pedestrian travel can become a more integrated and effective form of transportation to connect people to citywide destinations.

1 ASSESS

2 ENABLE

3 PLAN + DESIGN

4 INVEST

5 IMPLEMENT

Aerial View of Aizawl City, Mizoram

NMT IN AIZAWL TODAY

The baseline assessment carried out in Aizawl shows that the city has **hilly terrain** and is currently **experiencing signs of haphazard development on constrained developable land**. Both these aspects cause an i**ncrease in trip lengths and give rise to higher dependency on motorised vehicles**. Key NMT related characteristics observed in the city include:

- Dense habitation on typical hilly city characteristics of limited and non-expandable road spaces
- On-street parking occupies significant part of the vehicular carriageway reducing its effective capacity,
- Poor condition of road pavement with improper drainage facilities
- Nearly 50% of daily trips are by walk followed by mini buses that constitute nearly 25% of the mode share
- Average trip length of the city is 3 Km, where the walking trips are 0.9 Km, that implies a potential to encourage NMT as a mode of choice.

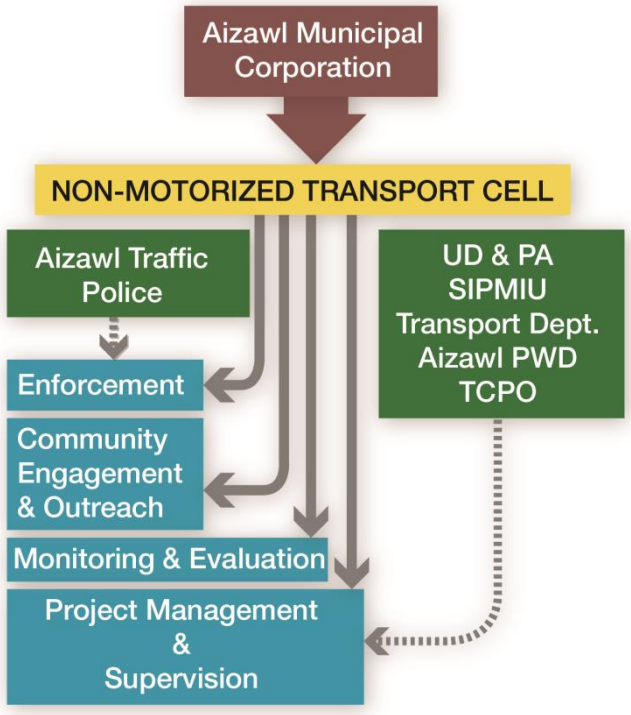
Apart from the above mentioned issues, an important NMT feature observed in Aizawl is the network of public stairs connecting parallel roads at different levels. However, these stairs are observed to be in bad condition with irregular risers and treads, poor surface condition and illumination creating uncomfortable pedestrian connections..

SUPPORT FOR NMT

Implementing the Aizawl NMT Plan will require leadership from AMC to support and encourage the “culture of walking and cycling”. It will require extensive collaboration amongst city departments, a commitment by city leadership and staff at all levels, and cooperation by other agencies and stakeholders.

Key Strategies:

- *Build leadership support and identify project champions:* AMC, UD & PA and Traffic Police will play a crucial role in plan implementation and identifying local champions.
- *Undertake Capacity Building:* Starting with adopting a citywide NMT Policy, the Plan recommends establishing a dedicated NMT cell within the AMC to build local capacities to undertake NMT implementation and enforce identified measures.



Proposed NMT Cell in AMC

Stakeholder Consultation in Aizawl

DESIGN INTERVENTIONS

The ‘Plan + Design’ section presents a plan for Aizawl at multiple scales. Primarily, it proposes development of an NMT network that allows for direct, coherent, safe, attractive and comfortable routes for all NMT users across most desire corridors. The following key ideas summarize the proposed NMT improvements in Aizawl.

NMT Network Improvement

1. Proposed Street Hierarchy

2. Retrofitting the Streets

3. Redesign Intersection Geometries

4. Public Stairs

5. NMT Predominant Streets

6. Enhancing Safety Security

7. Information to Road Users

Site-specific NMT Proposals (for Core City Area)

1. Pedestrian Streets

2. Street Retrofits

3. Intersection Improvements

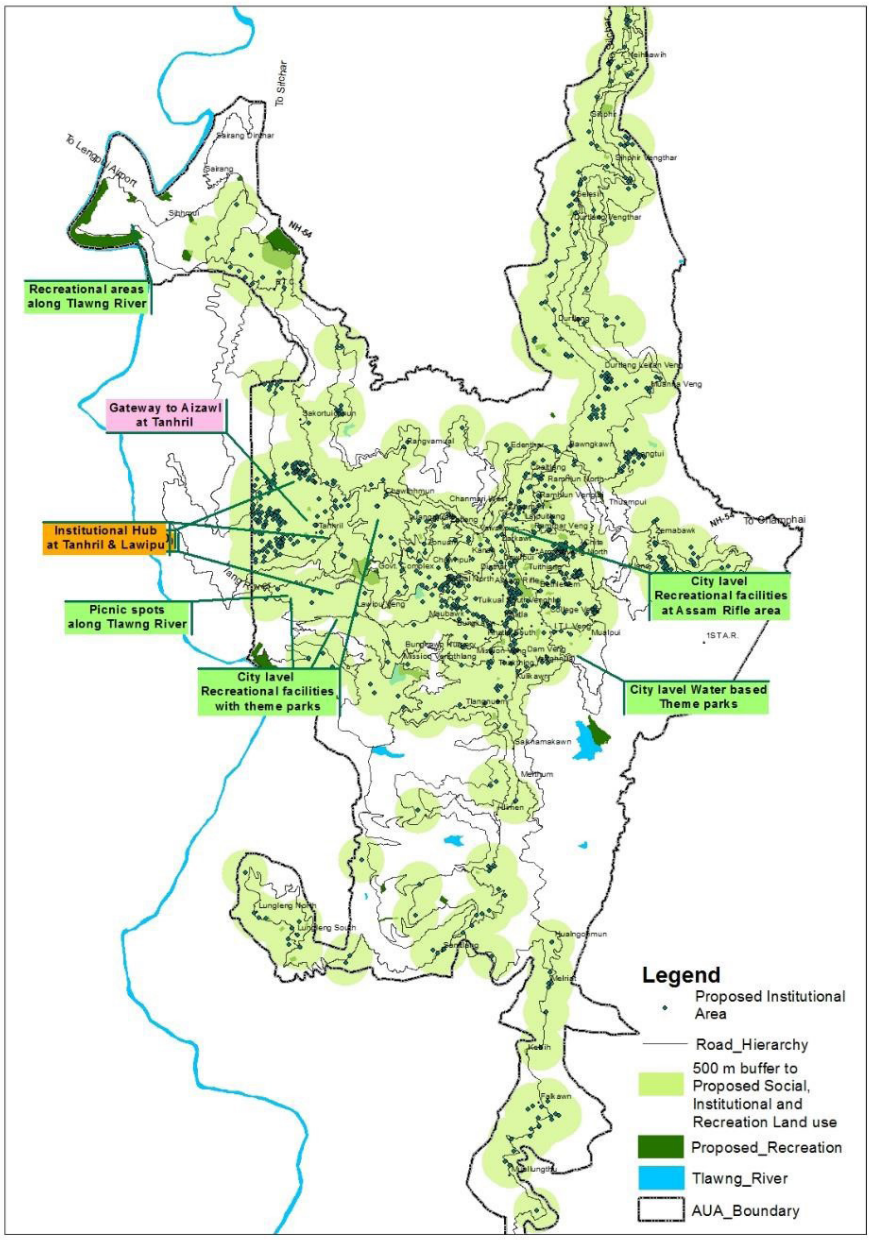
4. Public Stair Improvements

5. Multi-level Car Park

6. Signature Project: Pedestrianization of 1.5km stretch between Chanmari to Dawrpui

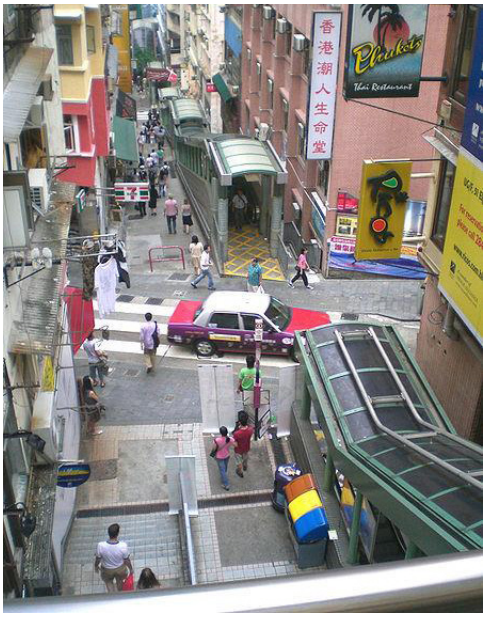
7. Pilot Project: Public Stairs along main commercial stretch

DESIGN INTERVENTIONS

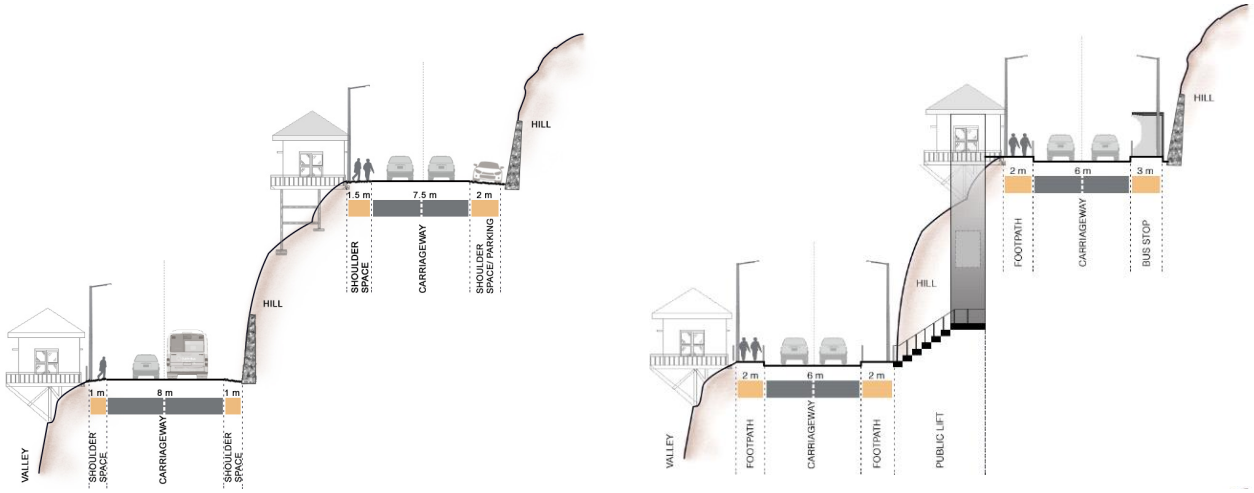


NMT facility improvement zones with 500m buffer around social, institutional, and recreational establishments

Existing condition of public stairs in Aizawl



Network of Escalators connecting different levels of the city.



Existing and proposed street sections with NMT connections (lift)

INVEST

Analysis of the city budget clarifies that the total estimated cost of proposed length of footpaths is approximately 4 times more than the estimated cost in CTTS. The cost of investments needed for footpath has been grossly underestimated by the city.

Particulars	Quantity in Km	Cost in INR
Cost Estimate for NMT facilities in the CTTS	25	7.50 Cr
Proposed CSP footpath cost estimate	59.5	31.22 Cr

It is strongly suggested to revise the allocation as per the actual requirement and adopt the other financing options, including, identifying unconventional financing sources like, State transport duties revenue reallocation, Capital market funds, Land monetization, NMT fund and Congestion Mitigation and Air Quality Improvement Program.

Bundling NMT improvement projects with other larger proposals makes the projects financially attractive and implementable. Also, based on the “polluter pays”principles, green financing options are proposed for the city of Aizawl.

IMPLEMENT

One of the key tasks in implementing the Aizawl NMT Plan will be to identify priorities based on available resources, political and public support and strategic opportunities to link with other existing programs. The following table describes the roles and responsibilities of various agencies in successfully implementing the recommendations contained in this plan.

Stakeholder	Potential Roles
Politicians	• Build commitment and motivate the society. • Enact regulatory changes, if necessary • Ensure cooperation between various agencies
PWD, Aizawl	• Ensure integration of the system with bicycle Infrastructure like signage and signalling under PWD to support increased bicycle traffic volume. • Provide space under PWD jurisdiction for walking and cycling infrastructure. • Ensure implementation of all NMT facilities.
Aizawl Municipal Council	• Provide space under AMC jurisdiction for walking and cycling infrastructure. • Ensure integration of the system with public facilities. • Provide Advertisement permission for various locations along the NMT routes in the jurisdiction
ADA	• Provide space under ADA for walking and cycling infrastructure.
Transport Department	• Ensure integration of the system with walking and bicycle Infrastructure like signage and signalling to support increased pedestrians and bicycle traffic volume. • Ensure check on growth of motorized vehicles. • Ensure proper installation of advertisement according to the guidelines. • Ensure integration of public bicycle infrastructure with bus infrastructure under. • Promote the use of public bicycles to current bus users
Town and Country Planning Organization (TCPO)	• Provide space under AMC jurisdiction for walking and cycling infrastructure. • Ensure integration of the system with public facilities. • Provide Advertisement permission for various locations along the NMT routes in the jurisdiction.
Police	• Maintain a safe environment for walking and cycling • Enforce the traffic rules for safety. • Protect the city from theft and vandalism of the public facilities and infrastructure.

Roles and Responsibilities of various stakeholders, Source: iTrans

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ABBREVIATIONS

AMC	:	Aizawl Municipal Council
AUA	:	Aizawl Urban Area
BRT	:	Bus Rapid Transit
CBD	:	Centre Business District
CDP	:	City Development Plan
CTTP	:	Comprehensive Traffic and Transportation Plan
FAR	:	Floor Area Ratio
GIS	:	Geographic Information System
HMV	:	Heavy Motorised Vehicle
IPT	:	Intermediate Public Transport
ITS	:	Intelligent Transport Systems
KM	:	Kilo Meter
KMPH	:	Kilo Meter Per Hour
LOS	:	Level of Service
LRT	:	Light Rail Transit
MLCP	:	Multi-Level Car Parking
MRT	:	Mass Rapid Transit
MV	:	Motorised Vehicle
NAMA	:	Nationally Appropriate Mitigation Action
NMT	:	Non-motorised Transport
NMV	:	Non-motorised Vehicle
PBS	:	Public Bicycle Sharing
PCU	:	Passenger Car Unit
PM	:	Particulate Matter
PT	:	Public Transport
PWD	:	Public Works Department
ROW	:	Right of Way
RSI	:	Road Safety Index
RSPM	:	Respiratory Suspended Particulate Matter
SP	:	Superintendent of Police
SIPMIU	:	State Investment Programme Management and Implementation Unit
TAP	:	Transportation Alternatives Program
TCPO	:	Town and Country Planning Organization
TNUDF	:	Tamil Nadu Urban Development Fund
TOD	:	Transit Oriented Development

UD	:	Urban Development
UD&PA	:	Urban Development and Poverty Alleviation
UMTA	:	Unified Metropolitan Transport Authority
UNDP	:	United Nations Development Programme
UTF	:	Urban Transport Fund

CHAPTER I: INTRODUCTION

1. INTRODUCTION

The Ministry of Urban Development (MoUD), Government of India, is the primary agency responsible for formulation and administration of the regulations and laws relating to housing and urban development in India. MoUD, through its policies and programmes, such as the National Urban Transport Policy (NUTP 2006), continues to invest in strengthening the capacities of urban local bodies and state governments to create conditions that will make Indian cities more liveable and sustainable for its citizens. One such initiative to further the goals of the NUTP 2006 is the Sustainable Urban Transport Project (SUTP), supported by the World Bank and UNDP under the Global Environment Facility (GEF) programme.

Under this GEF-SUTP programme, MoUD has appointed IBI Group as the lead consultant for developing National-level Guidance Documents and City Specific Plans for (i) Transit Oriented Development (TOD), (ii) Non-motorised Transport (NMT), and (iii) Public Bicycle Sharing (PBS) Scheme. The guidance document(s) present a "how-to" manual for each of these three sustainable transportation concepts in detail, by considering the lessons learned from worldwide experience and contextualizing the concepts to better suit India's unique conditions.

To implement the findings and recommendations of the Guidance Documents, City Specific Plans for two cities were prepared for each of the above-mentioned concepts. Lessons learned from these City Specific Plans were integrated in refining the Guidance Document(s) and ensuring that they are based on ground realities with a focus on implementation.

This report contains the Non Motorised Transit (NMT) Plan for the city of Aizawl (hereinafter referred as the 'Aizawl NMT Plan') as one of the two City Specific Plans prepared to test the applicability of the NMT Guidance Document in cities. Aizawl, under the Urban Development and Poverty Alleviation Department (UD&PA) acting as the nodal agency, was selected as one of the two demonstration cities because of the following reasons:

- Presence of high NMT modal share (49% Walk[1])
- To represent city with hilly terrain where NMT solutions, treatments and designs developed based on road geometries, and slopes vary
- The tourism potential of Aizawl can be further enhanced by providing state-of-the-art walking and cycling infrastructure in the city.

1.1. Plan Objectives

The Aizawl NMT Plan is intended to provide UD&PA with a strategic guiding document for identifying and prioritizing pedestrian and bicycling infrastructure improvements. The key objectives of the NMT Plan are:

- Maintain and increase the non-motorised commuter mode share.
- Reduce vehicular congestion by increasing the attractiveness of NMT for short distances (<5km) [2], including increasing pedestrian safety.
- Identify solutions to create "complete streets" that makes Aizawl a more walkable city despite its challenging topography and constrained right of ways.
- Develop a set of realistic goals to promote walking and in selected area bicycling supported with achievable implementation steps.

[1] *Source: Aizawl Comprehensive Traffic and Transportation Plan, 2011*

[2] *Study on Traffic and Transportation Polices and Strategies in Urban Areas in India" by Wilbur Smith Associates, Page 21, May 2008*

1.2. Planning Process and Methodology

This Aizawl NMT Plan follows the NMT Step-by-Step Planning Process recommended by MoUD's National Level NMT Guidance Document. The section below presents a detailed description of the five-step methodology adopted in preparation of this plan and the report structure.

		Tasks	Outcomes	Reference
		NMT FRAMEWORK 1 ASSESS	**'Assess'** guides authorities for establishing baseline that needs to be carried out to understand the current status of the city.	
Assess	1	Review City Characteristics and Transport Scenario	NMT Needs Assessment	Section 2.1, 2.4, 2.5
	2	Conduct review of current institutional support, legislative and regulatory environment	NMT Readiness Assessment	Section 2.2, 2.3, 2.6, 2.7
	3	Map existing initiatives and their impact	Documentation of key learnings	Section 2.9
	4	**Define scale and type of NMT Plan**	**Scale and Scope of NMT Plan**	**Section 2.10**
	5	Identify funding opportunities for undertaking NMT studies	Funding Sources and Opportunities	
	6	**Identify stakeholders and conduct and actors analysis**	**Actors analysis**	**Section 2.12**
		NMT FRAMEWORK 2 ENABLE	**'Enable'** provides the steps necessary to translate the policies into local actions and aims at building commitment and encouraging leadership to change culture and perceptions.	
Enable	**1**	**Establish leadership support and project champions**	**NMT Cell**	Section 3.1
	2	Establish NMT Vision and time-bound targets	NMT Vision and Targets	Section 3.2
	3	Identify and address policy level barriers	Gaps, Consistencies and Recommendations	Section 3.2
	4	**Define project requirements and delivery mechanism**	**NMT Plan Terms of Reference**	**Section 3.3, Appendix C**
	5	**Develop technical capacity**	**Augmentation of in-house technical skills**	Section 3.2, 3.4
		NMT FRAMEWORK 3 PLAN + DESIGN	**'Plan + Design'** defines a flexible planning process that city may adapt based on the local context to undertake planning and implementation of NMT infrastructure at varying scales.	
Plan + Design	1	Map Existing Infrastructure and develop NMT Demand Estimates	Existing Conditions Inventory / NMT Demand Analysis	Section 2.43, 2.5
	2	Conduct Stakeholder Workshop / Meeting(s) to Revalidate Vision, Issues and Opportunities.	Stakeholder Inputs	Section 2.11, Appendix D
	3	**Identify Gaps / Plan Expansion of NMT Network**	**NMT Network Plan with Street Hierarchy / Street Typologies**	**Section 2.4, 4.1, 4.2**
	4	**Formulate context-specific NMT proposals**	**Master list of NMT proposals**	**Section 4.3, 4.4, 4.5**
	5	**Identify pilot projects and signature projects**	**Project Plans**	**Section 4.4**
	6	Develop current and horizon year scenarios using traffic modelling tools	Scenario Models	Section 4.5
	7	Identify implementation and phasing strategy	Phasing Strategy and Preliminary Costing	

		Tasks	Outcomes	Reference
		**4 INVEST**	**'Invest'** explores the possible financing options that city could use to ensure that funding for NMT is given equal priority as urban roads.	
Invest	1	**Prioritise NMT proposals for city budget allocations**	**Capital Improvement Program**	**Section 5.1**
	2	Identify alternative financing sources	Alternative financing sources	Section 5.3
	3	Develop incentives for private stakeholders to invest in NMT infrastructure	Private stakeholder incentives/ DCR modifications	Section 5.2, 5.3
	4	**Establish budget allocations for NMT up gradation and maintenance**	**Up gradation and Maintenance Plan**	**Section 5.1**
		**5 IMPLEMENT**	**'Implement'** focuses on the various components of NMT implementation- from the organizational framework to community engagement, outreach, project management and monitoring and evaluation.	
Implement	1	**Define clear roles and responsibilities for NMT development and maintenance**	**Roles and responsibilities**	**Section 6.1**
	2	Conduct advocacy and awareness campaigns	NMT events/ educational campaigns	Section 6.2
	3	**Ensure high quality project delivery**	**Uniform tendering and contracting procedures**	**Section 6.3**
	4	**Conduct NMT sensitization workshops with enforcement officials**	**Sensitization/ training workshops**	**Section 6.4**
	5	Develop monitoring and evaluation framework to measure success of NMT targets	Communications Strategy	Section 6.5

Source: NMT Guidance Document, MoUD, prepared by IBI Group

CHAPTER II: ASSESS

2. ASSESS

The first step in preparing a comprehensive NMT plan involves an assessment of existing conditions related to walking and cycling in Aizawl. This baseline assessment includes determining the city's needs across multiple levels – institutional structures, physical infrastructure, people's needs and the stakeholders' interest.

Working in close collaboration with the Urban Development and Poverty Alleviation Department, Government of Mizoram (UD&PA), relevant information from the city's previous planning efforts was compiled to analyze the gaps and consistencies in available data. Table 2.1 lists the secondary data sources referred in preparation of the baseline assessment.

Table 2.1: Secondary data sources for baseline assessment

Data Source	NMT Specific Analysis
Master Plan for Aizawl: Vision 2030	Base map, city profile, demographic data
Comprehensive Traffic and Transportation Plan (CTTP) 2011 • Travel characteristics • Public transport, IPT, Pedestrians and traffic Data	Road inventory, Intersection design and cross section, NMT user profile – NMT network planning and demand estimation
Aizawl Municipal Council budget and annual accounts	Analysis of city budgets Financial planning and investments
City Development Plan for Aizawl (JnNURM) - 2010	Location of utilities during implementation planning
Ward Boundary Map *(Aizawl Municipal Council)*	Boundary for study area delineation
Land use *(Master Plan for Aizawl: Vision 2030)*	Identify commercial centres, institutional and industrial zones etc. – trip attractions
Geographical information data – maps and shape files *(Master Plan for Aizawl: Vision 2030)*	Data analysis and mapping – road hierarchy, land use, black spots, NMT proposals
Census data – *(Master Plan for Aizawl: Vision 2030, Census of India)*	Validation of future population, growth and demand according to master plan
Building Regulation data *(The Aizawl Municipal Council Building Regulations, 2012)*	NMT infrastructure designing
The Mizoram Municipalities Act. & Aizawl Municipal Council Organization Structure	Institutional structure planning
Display of advertisement and hoarding Regulations *(The Aizawl Municipal Council Display of Advertisement and Hoarding Regulations, 2013)*	Advertisement use, revenue sources and cost estimation
Road statistic data – length, width, type of pavement, type of road *(Comprehensive Traffic and Transportation Plan (CTTP) 2011, Road inventory survey to be done)*	NMT infrastructure designing – cross section and network design
Street vendors *(Town Vending Committee, Aizawl)*	NMT infrastructure designing – cross section
Street lighting *(Development of Aizawl Solar City Master Plan 2011 & Aizawl Municipal Council)*	Identify unsafe and dark areas.
Accident data *(Comprehensive Traffic and Transportation Plan (CTTP) 2011)*	Identify black dots, accident prone areas
Parking data *(Comprehensive Traffic and Transportation Plan (CTTP) 2011)*	NMT infrastructure designing – cross section
Licencing Regulations *(Department of Transport,*	Reviewing legislative and regulatory environment

Data Source	NMT Specific Analysis
Government of Mizoram, India)	
Motor Vehicle rules *(Department of Transport, Government of Mizoram, India)*	Reviewing legislative and regulatory environment
General observation survey	Identify users and travel characteristics
Cost Estimates- (Schedule of rates - *Government of Mizoram, India)*	Costing for the projects – financial planning

Source: iTrans

The baseline assessment process involved meetings and analysis of data collected from the multiple departments involved in transportation and urban development at the state and city levels. Agencies interviewed included:

Aizawl Municipal Council, Aizawl Development Authority, Aizawl Traffic Police, Town and Country Planning Organization and others.

The stakeholder meetings focussed on understanding the perceptions of governmental agencies related to the state of the NMT infrastructure in the city- its current status and the future vision for integrating NMT in the overall transportation priorities. The on-ground issues and barriers regarding the status of walking and cycling were primarily focussed around the paucity of road space, hilly topography not conducive for cycling and conflict with increasing motorization. However, the authorities in Aizawl expressed full support in making the city friendlier and comfortable for pedestrians.

The following sections presents a detailed description of the baseline assessment of citywide conditions to better understand the city's demographic composition, institutional structure, and existing physical conditions, as well as to identify future opportunities for improvement. These assessments were done using existing data provided by the city. For future planning purposes, it is recommended that the city should create a consolidated GIS database to integrate this information and use it for detailed NMT planning projects.

2.1. Aizawl City Profile

Aizawl, the capital city of Mizoram, is the political, commercial, educational and cultural hub of the state. Situated in the north eastern region of India, Aizawl is situated on a ridge of 1,132 metres (3,715 ft) above sea level, with the Tlawng River valley to its west and the Tuirial River valley to its east. Aizawl is relatively remote, connected to its surrounding cities and regions mainly by air and road (Figure 2.1). The nearest rail connection, at Silchar, is 184 km away.

As the administrative centre of the state, Aizawl houses all important government offices, including the State Assembly and Secretariat. Even though the city's economy is primarily sustained by public administration services and complementary banking services, the city has attracted considerable economic investment in the previous decade. The state of Mizoram is one of the fastest growing economies in the country, having reported a Gross State Domestic Product (GSDP) of 11% during the 2007-2012 Five Year Plan, far exceeding the national average of 7.9%.[3]

The construction and service sectors, primarily located in Aizawl are the largest contributors to the GSDP. In addition to economic opportunities, Aizawl offers relatively outstanding opportunities for education. This makes Aizawl an extremely attractive location for economic investment and a magnet for migrants from the north-eastern states of India. Growing levels of in-migration has resulted in rapid urbanization and haphazard development. The city is currently grappling with finding ways to grow sustainably in order to accommodate the growing population and economic activities.

[3] *http://www.business-standard.com/article/economy-policy/mizoram-gsdp-growth-at-11-during-11-plan-113121700439_1.html*

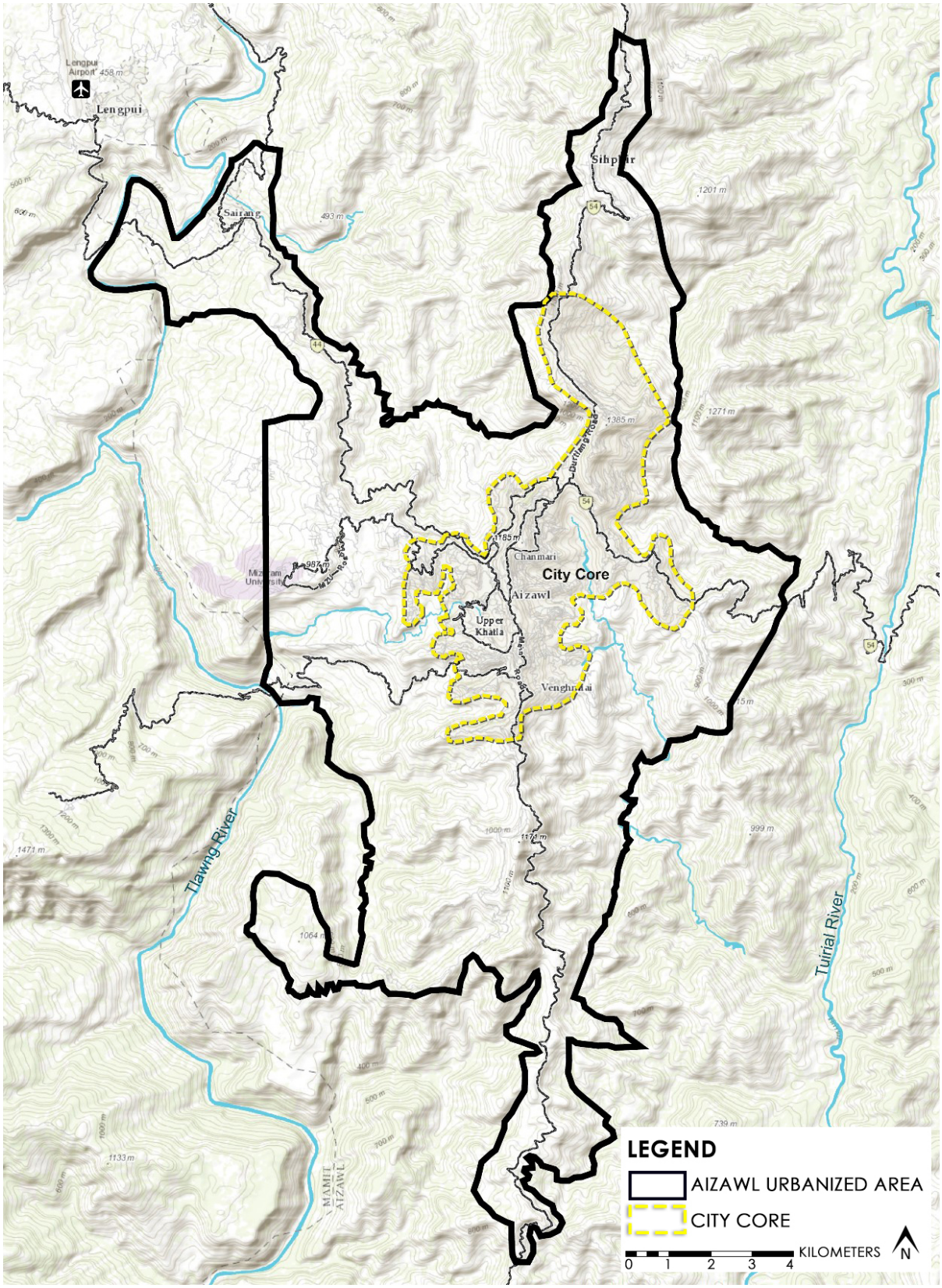


Figure 2.1: Administrative boundary of Aizawl

Source: Adapted from Terrain Base Map, ESRI 2015

2.1.1. Administrative Structure

The city extents of Aizawl have expanded substantially in the last two decades. Many villages located in the sub-urban and fringe areas of the city have become part of Aizawl, collectively known as the Aizawl Urban Area (AUA). The Aizawl Development Authority (ADA) and AUA were established in 2005. AUA constitutes 82 Local Council and 14 Village Council areas. The total AUA planning area equals 291.91 sqkm. Figure 2.3 shows the AUA and AMC administrative boundaries. The AMC area measures 129.91 sqkm and is divided into 19 wards, and further divided into 82 localities each having an elected representative.

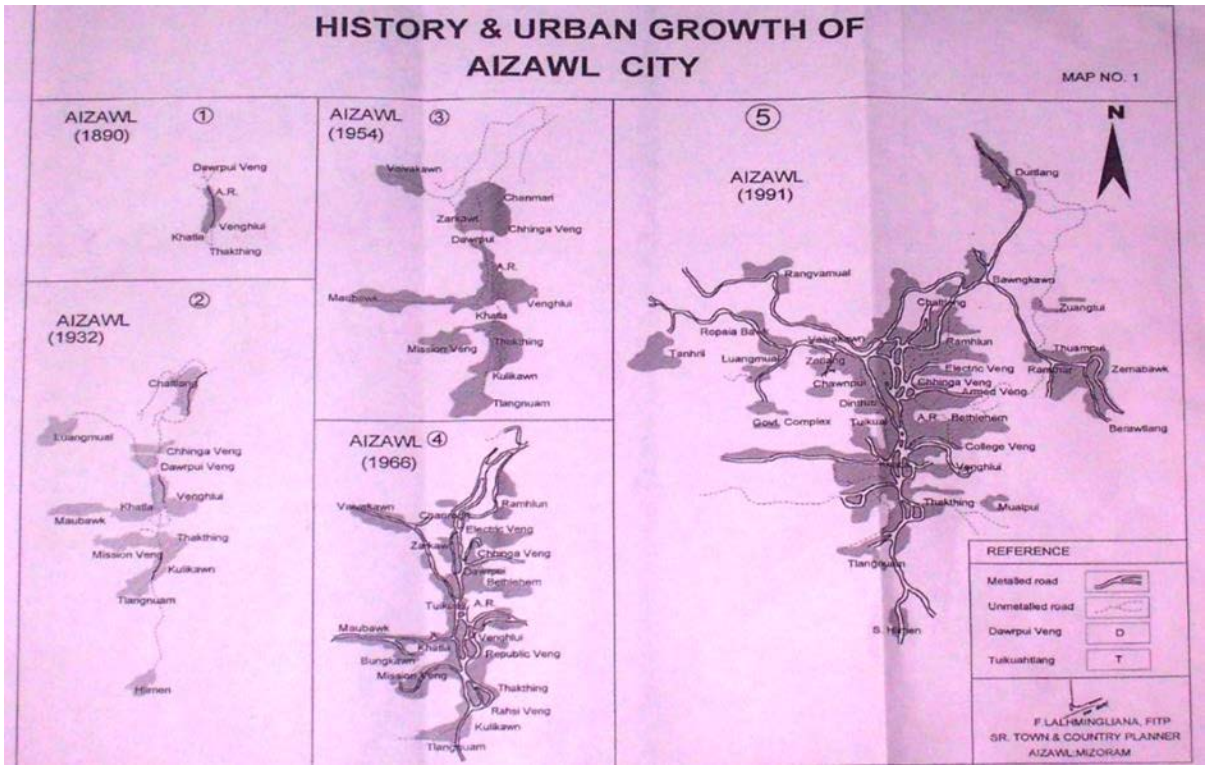


Figure 2.2: Chronological development of Aizawl

Source: Master Plan for Aizawl: VISION 2030, Aizawl Development Authority, 2011

The Greater Aizawl City Development Planning Area was notified in 2011 and included the built up city core, peripheral developed areas, intermediate areas, and the immediate hinterland. The City Development Plan notification aimed at developing Aizawl to become an engine of growth for the state. The other objectives of this notification were: to protect the city against natural disasters; to preserve catchment areas; and to reserve land for future development. The delineation of a larger planning area and the constitution of the AMC have provided the opportunity of planning an integrated land use and transport infrastructure at the citywide scale.

As a key step to meet the requirement of the 74th Constitutional Amendment 1992[4], the Aizawl Municipal Council (AMC) was constituted in 2008. It is governed by the Board of Councillors and the Executive Council is headed by the Chairman assisted by Vice Chairman and three other Executive Councillors.

[4] *The 74th Constitutional Amendment Act delegates' urban development functions to local urban bodies. The main provisions include constitution and composition; constitution of wards committees; reservation of seats; duration of municipalities; powers and functions; finances; finance commission; elections; district and metropolitan planning committees, etc. The 74th CAA, expects that ULBs will assume responsibility for urban planning, water supply, social and economic planning, slum up gradation, public health, etc.*

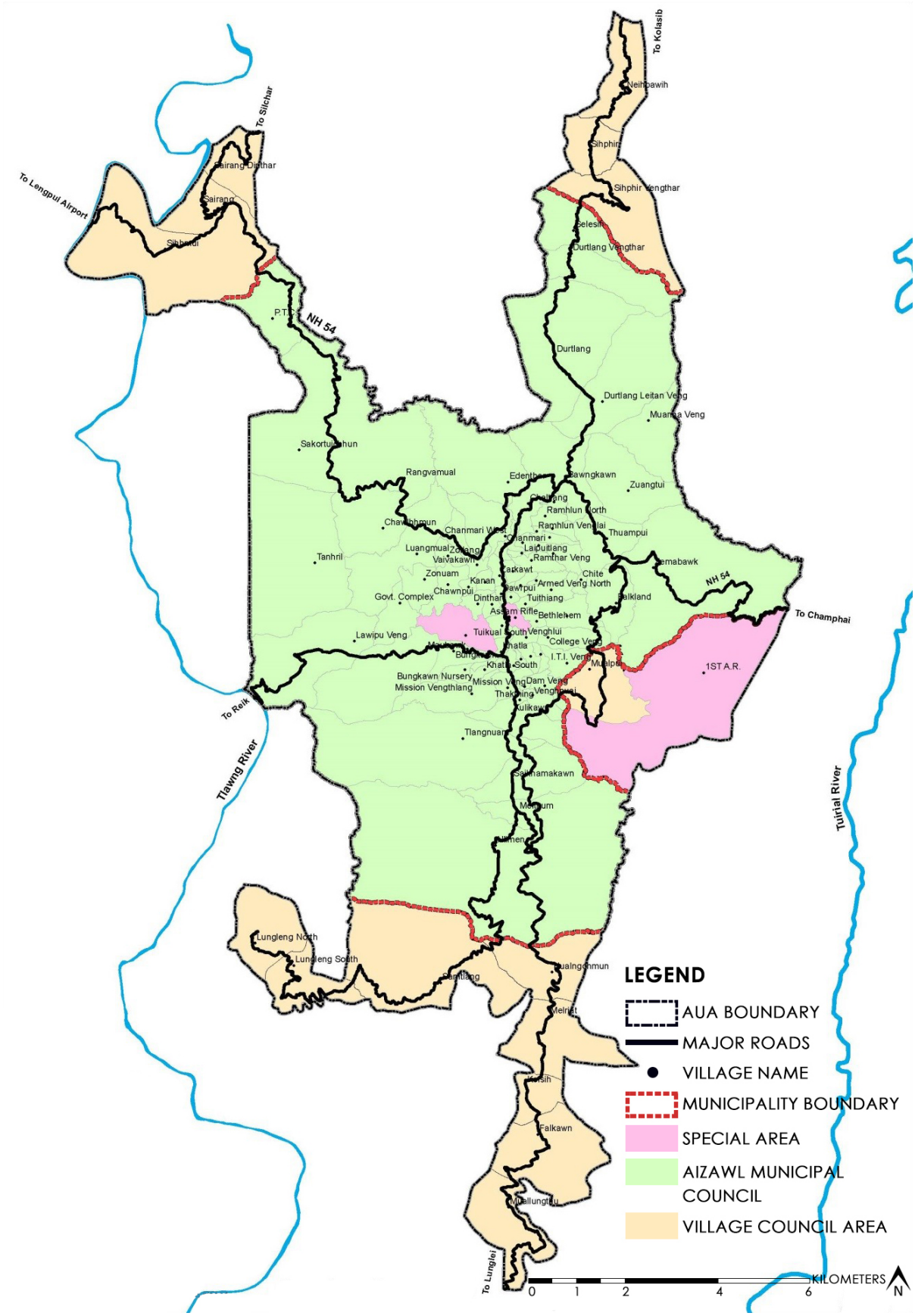


Figure 2.3: Planning area boundary

Source: Modified based on the original map form Master Plan for Aizawl: VISION 2030, Aizawl Development Authority, 2011

2.1.2. Demographic Profile

As per the 2011 census, the Aizawl city municipal area has a population of 291,822, accommodating over 25% of Mizoram state's total population. A high literacy rate of 98.8% and female dominated sex ratio of 1029 per 1000 males, makes the city uniquely progressive as compared to the rest of the country. The municipal area's population density has consistently increased over the last three decades, although the decadal growth rate has reduced, presumably due to physical growth constraints. Table 2.2 summarises the demographics including population, area and number of households.

Table 2.2: Population, urban area and total number of households at a glace

Abstract from census 2011	Mizoram	Aizawl Municipal	% share in State
Total Population	10,97,206	291,822	26.59 %
Total Households	2,22,853	60,635	27.20 %
Area	21,081 sq.km.	129.91 sq.km.	0.61 %

Population growth of Aizawl City for the last four decades	**1981**	**1991**	**2001**	**2011**
	74,493	158,901	243,509	291,822
Decadal Growth		113%	53.25%	16.56%

Source: Census 2011 and Master Plan for Aizawl: VISION 2030, Aizawl Development Authority 2011

The population density for Aizawl municipal area is 2,246.33 person per sq.km. Table 2.3 gives the decadal population density for Aizawl between1961 and 2011. Figure 2.4 shows the existing population density in the planning area.

Table 2.3: Population density

Census Year	Area in sqkm	Density per sqkm
1961	12.95	1100.92
1971	18.55	1729.70
1981	110.00	677.20
1991	128.98	1203.60
2001	128.98	1781.00
2011	129.91	2246.33

Source: Census 2011

The city of Aizawl has one of the highest population densities for hilly cities in India. The need for NMT planning becomes even more critical in a constrained environment Aizawl to ensure that future growth does not result in uncontrolled increase in vehicle ownership.

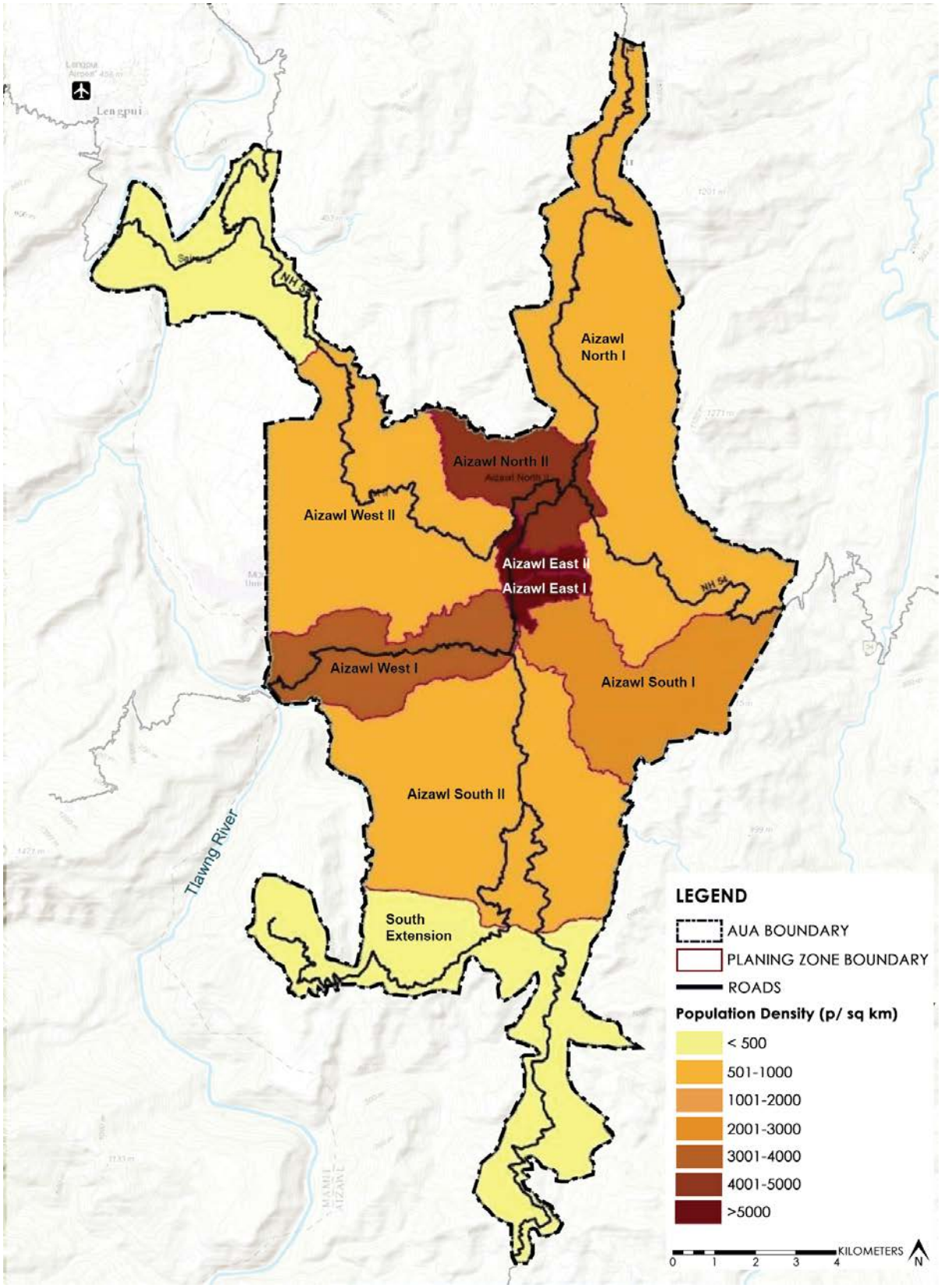


Figure 2.4: Population density map of Aizawl

Source: Adapted from Master Plan for Aizawl: VISION 2030, Aizawl Development Authority, 2011

2.1.3. Land Use

Mizoram has a total of 22 urban settlements, of which Aizawl city is the largest, both demographically and physically. The urban settlements in Aizawl Urban Area have mainly developed at higher altitudes and ridges, principally along the National and State Highways. The structural pattern of Aizawl Urban Area shows growth towards the north-west (Sairang) due to presence of NH-54, and in Tanhril and Sakawrtuichhun due to availability of developable land. Another agglomeration along the State Highway is taking place in the south direction, i.e., Muallungthu Agglomeration, which is currently developed very sparsely.

The Master Plan of Aizawl 2030 has prepared a comprehensive plan for development and infrastructure facilities in the region. As per the Master Plan the general land use breakup for Aizawl Urban Area shows that the largest share of land use is vacant land (49.83%) followed by natural reserves of 26.83%. Residential area is only 5.75% (953.92 ha) of the total Aizawl Urban Area. Figure 2.5 illustrates the existing land use distribution in the city (2011).

The Aizawl Urbanised Area is divided into nine planning area zones. The largest share of resident population of these zones is in Aizawl East-I and Aizawl East-II zones, which have 42.75% and 39.84% respectively[5]. Other non-residential land use categories like commercial, public-semi-public are mainly concentrated in Aizawl East-I, East-II, and South-I. Figure 2.6 shows the existing land uses in the planning area.

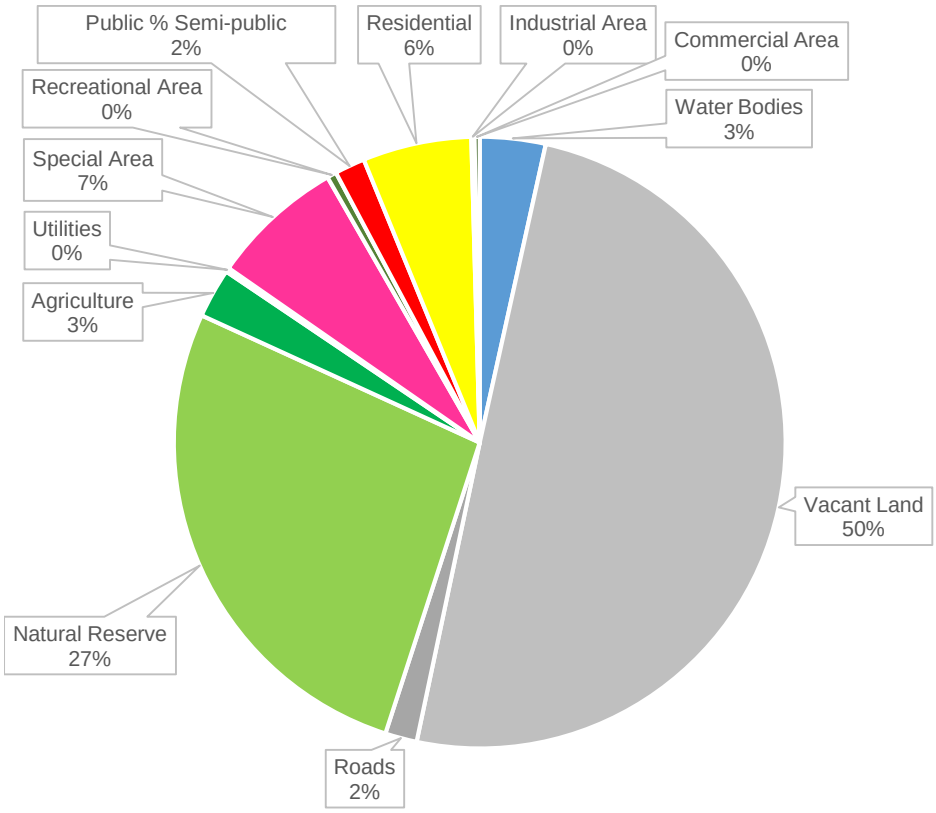


Figure 2.5: Existing land use distribution (2011)

Source: Master Plan for Aizawl: VISION 2030, Aizawl Development Authority, 2011

[5] *Census 2011*

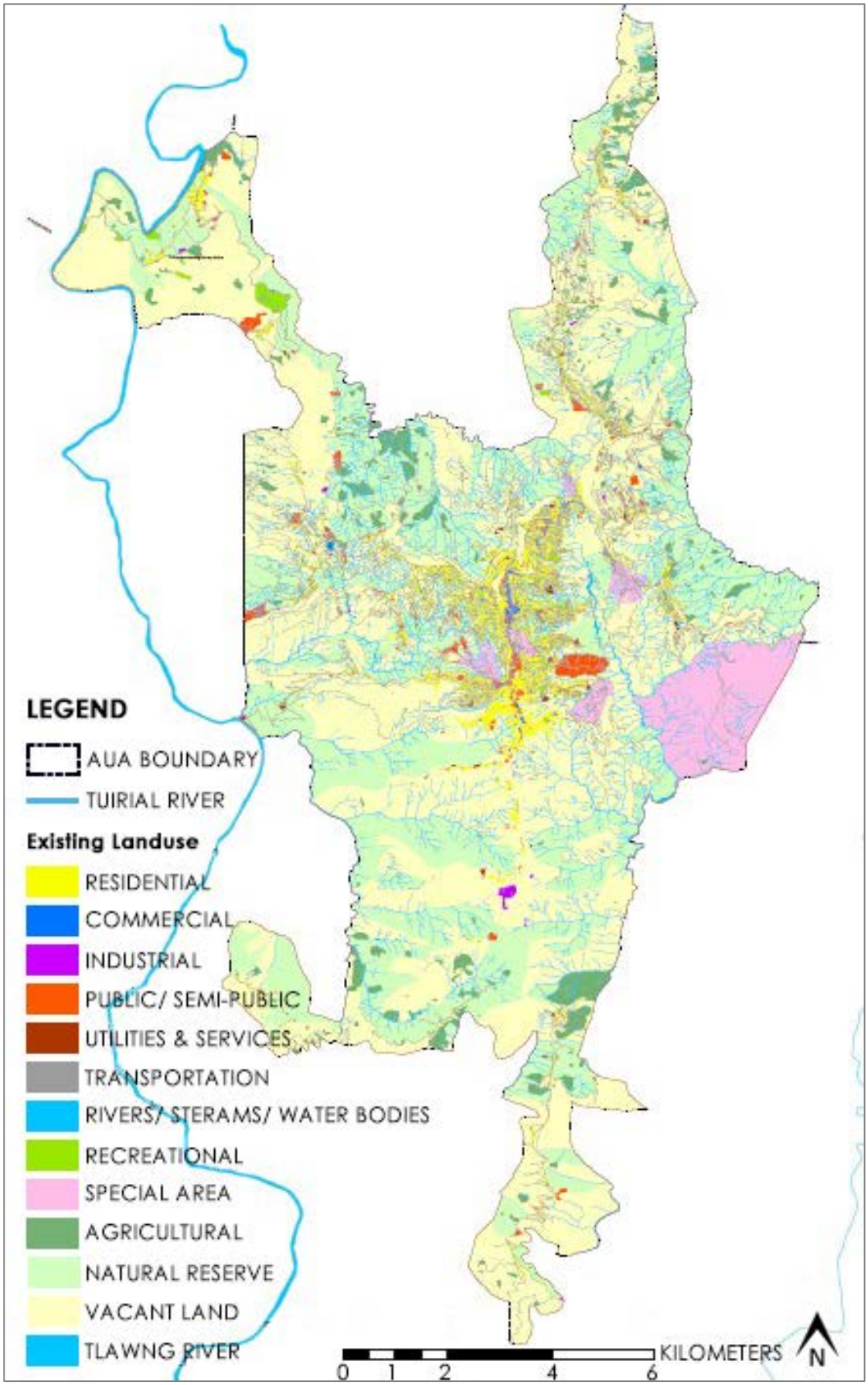


Figure 2.6: Existing land use distribution map of Aizawl (2011)

Source: Adapted form Master Plan for Aizawl: VISION 2030, Aizawl Development Authority, 2011

2.1.4. Mode Share

As evident from the mode share (Figure 2.7), walking is the most preferred mode for Aizawl accounting for nearly 50% of the total trips. According to the Comprehensive Traffic and Transportation Plan 2011, the average trip length in the city is about 3 Km. However 80% of all trips have less than the average trip length. The average travel time for commuting in the city is 21.5 minutes.

The average time taken for travelling indicates that the urban development form of Aizawl is compact and conducive to supporting non-motorised modes like walking and cycling, especially for the areas with flat terrain or slopes with gradients less than 4%.

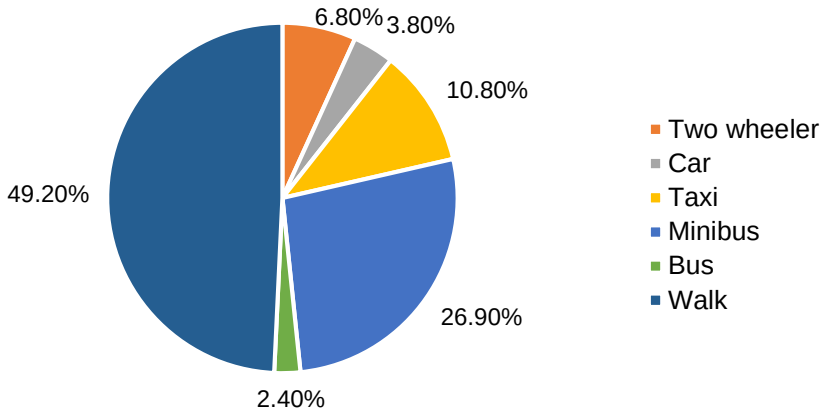


Figure 2.7: Modal share of Aizawl

Source: Aizawl Comprehensive Traffic and Transportation Plan, 2011

The core city of Aizawl is reasonably compact with most of the development along a spinal ridge. Figure 2.8 illustates the major activity nodes in the city. **All these destinations are located in the core area of the city and within 500 meters of the spinal road. Therefore, these can be made accessible by encouraging trips through the city's bus service with walking as the primary mode for completing the 'first and last mile' trips**. The road connecting Chanmari and Dawrpui through Zarkawt is the spinal linkage for major destinations in the city that are located on both sides of the road. The Bara Bazar, Millennium Mall, Luangmual Handicrafts Centre, the Mizoram State Museum and few major offices are present along this spinal linkage. Some of other major destination nodes of the city are the Chunga Bus Terminal, Civil Hospital and Chanmari West-park.

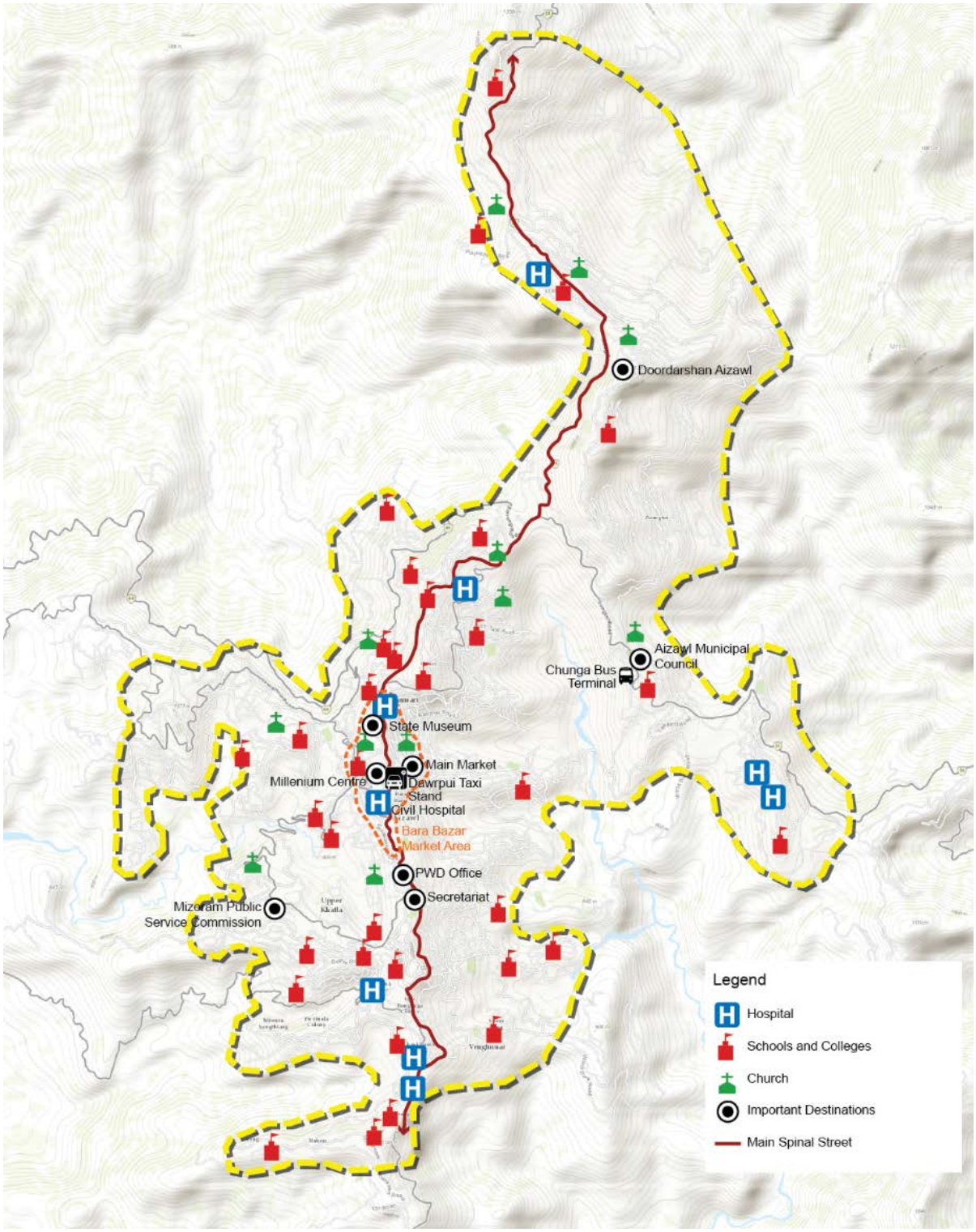


Figure 2.8: Major activity nodes in core city of Aizawl

Source: Adapted form Master Plan for Aizawl: VISION 2030, Aizawl Development Authority, 2011

Figure 2.9: Main spinal linkage (shown in red colour) of Aizawl city

Source: Adopted from Google earth map, accessed on 5th April 2015

2.1.5. Topography and Climate

The topography of Aizawl is not very different from its northeastern neighbours. The city is established at levels ranging from 80 m to 1,420 m (refer Figure 2.11) above sea level. The central spine of the city running north south is at a relatively higher elevation than the western and eastern parts of the city as shown in the Figure 2.11. **The undulating landscape is a significant barrier to all transport modes including NMT modes like walking and cycling that require human effort. However, walking being the most manoeuvrable mode is the most popular means of travel in the city. Several public stairs across the city provide shortcuts to people on foot. Steep grades are a barrier and potential hazard for bicycle riders. Cycling has potential in the areas of the city with gentler slopes (less than 5%). Slope mapping of roads should be made mandatory while retrofitting or designing of new roads.**

Aizawl has moderate temperatures throughout the year enabling a **comfortable environment for walking and cycling.** The summers are not very hot as the temperature remains between 20° to 30° Centigrade. The winters are very pleasant with temperatures ranging from 21° to 11° Centigrade. Aizawl experiences early sun rise compared to rest of the country due to its location in the eastern the part of India. In summers general activity starts as early as 4.00 am.

Figure 2.10: Steep Staircase near Bara Bazar, Aizawl

Source: iTrans

Though the climate and temperature are conducive to NMT, the city's topography is steep and irregular, and not universally accessible (Figure 2.10). These problems must be resolved to provide comfortable and independent mobility to all.

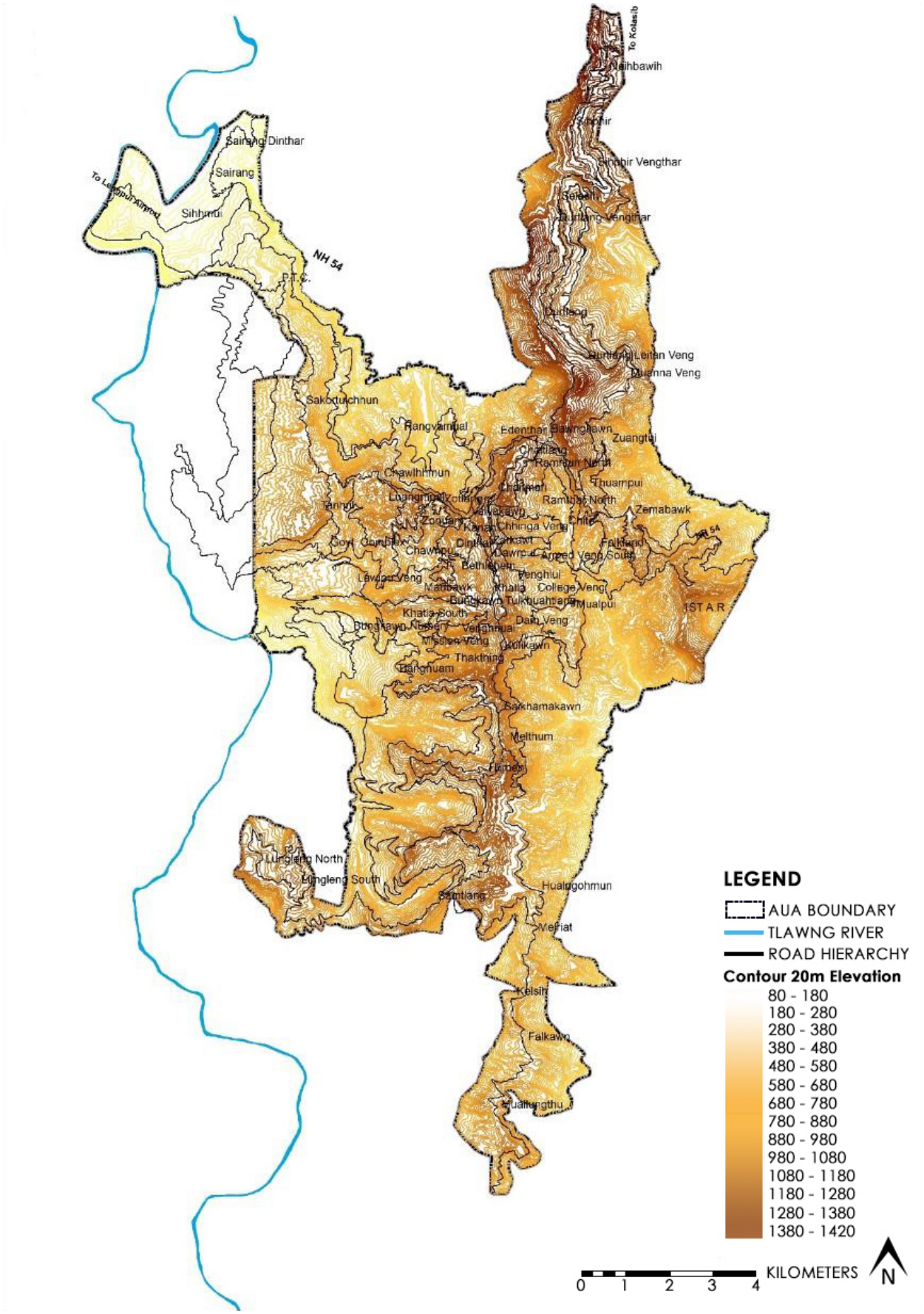


Figure 2.11: Topographical map of Aizawl

Source: Adapted form Master Plan for Aizawl: VISION 2030, Aizawl Development Authority, 2011

2.2. Planning and Policy Context

2.2.1. Master Plan for Aizawl: Vision 2030

The Master Plan for Aizawl was prepared in 2011 by the Aizawl Development Authority after the Aizawl Planning Area was extended through a Gazette Notification in 2006. The previous statutory Master Plan for Aizawl Planning Area was prepared in accordance with provisions of Mizoram Urban and Regional Development Act 1990, in 2002. The Master Plan seeks to make Aizawl:

- A destination for trade, commerce and administrative functions by leveraging the existing regional resources along with upgradation of human skills.
- A modern capital town of the North-Eastern region with the latest, state of the art infrastructure.
- A centre for ecological tourism through promotion of the array of festivals, dances and handicrafts.
- A city self-sufficient in all kinds of economic infrastructure.

The Master Plan proposed land uses in the city based on slope gradients and their susceptibility to landslides. Large contiguous lands with gentle slopes (under 36 degrees) are proposed for higher order functions including public and semi-public uses, with appropriate transportation links. Medium slopes are identified for parks and recreation based activities, whereas steep slopes are kept under no development zone. A new parallel CBD area is proposed at Sakawrtuichhun to cater to future demand for development along the western corridor. The proposed Land Use Plan however lacks consideration of mixed uses, which is the prevalent land use in Aizawl currently and is also extremely desirable for improving walkability.

The Master Plan also proposes road network augmentation as one of the most important priorities. It recommends a series of ring roads and bypass linkages to separate urban and regional traffic.

2.2.2. The Comprehensive Traffic and Transportation Plan (CTTP) 2011

The CTTP was commissioned in 2011 parallel to the Master Plan. The key findings of the CTTP are listed below.

- Aizawl is characterised by **narrow roads with high to steep gradients** and a number of **acute bends and curves** responsible for **low capacity and speeds** on the road networks.
- Almost all **roads in the city converge at the city** centre which is one of the main causes of **extreme congestion in central areas** during peak periods.
- The city lacks a clear road hierarchy.
- **High gradients and poor road geometry** resulting from space constraints cause **congestion** on most of the city's intersections.
- The **pedestrian volumes** generally tend to rise during the day and **peak at around 3p.m**. before they start falling again.
- Power House and Lower Bazaar witness **maximum pedestrian volumes** and Power House and Civil Hospital witness **maximum crossing volumes**.
- Most of the links have **inadequate footpath** network to accommodate the high pedestrian volume – forcing pedestrians to move along the carriageway.
- There is **no organised parking supply** in Aizawl. Except for a large commercial complex at the Millennium Centre, most parking supply primarily consists of haphazard on-street parking.
- The maximum turnover in parking was observed for two wheelers.
- Location-wise, the highest average parking duration is observed near Chanmari, while the minimum is observed between Vaivakawn and Temple

The CTTP has provided recommendations for short, mid, and long-term implementation. The NMT Plan builds on the proposals made by the CTTP. The following is a summary of key recommendations:

1. **Street Retrofitting**
   - Upgrading the existing roadways through resurfacing, structural improvements and regular maintenance of prioritised stretches, including:
     - Rangvamual – Hunthar (NH-54)
     - Vaivakawn – MizoramUniversity via Ramrikawn
     - Chanmari – Ramhlun south - Bawngkawn
     - Chanmari – Zarkawt – Bazaar
     - Bazaar – ITI
   - Intersection improvements, road widening and removal of bottlenecks at Khatla junction as a priority. Recommended improvements at this junction include:
     - Development of Reversible lane (*Counter flow or Contra flow lane)*
     - One-way street concept (on restricted hours) at one of the intersection arms
     - Proper markings on roads and sign board
2. **Traffic Congestion**
   - **Shifting the working hours of educational institutions** from 8 am to 7 am which will help in staggering the high concentration of trips during peak hours.
   - **Restrict the goods transfer timings** from 7 am to 8 am into the city core.
   - Convert selected **two-way streets to one-way** to improve traffic circulation from 7am to 6 pm. Proposed one-way stretches include:
     - Zodin – Raj Bhawan
     - Raj Bhawan - Sikulpuikawn
     - Sikulpuikawn – Khatla
     - Khatla – Zodin square
3. **NMT**
   - **Public stairs** can improve connectivity and accessibility of public to all the locations as these can be designed in order to reduce the distance between the places and develops shorter walk-able paths. Suggested improvements and provisions of new stairs at important locations.
   - **Provision of footpaths** for connectivity and internal circulation with zebra crossings and **pedestrian signs** at major intersections and mid-block crossings.
   - **Footover bridges** proposed at some intersections for pedestrian use.
   - Possibility of **complete pedestrianization** recommended for some streets.
4. **Parking**
   - **On-street Parking**- in combination with the one-way street management.
   - Provision of **off-street parking** facilities to be accompanied with prohibition of on-street parking in these areas.
5. **Access to the New Capital Complex**
   - Plan to **improve Khatla junction and the road leading to the New Capital Complex** in order to effectively carry the increased travel demand to this area.
   - **Circulation plan** for the new Capital Complex (including access to the complex and internal circulation).
   - **Plan for alternative access** to the new Capital Complex from the proposed ring road enabling direct connectivity with the national highway network and airport.

6. **Public Transport and IPT Facilities**
    - **Public Transport Service Expansion** based on the projected traffic. **Increase in the size of city bus fleet** to 150 buses by 2017 and 500 buses by 2027.
    - **Recommendation for a route rationalization exercise** immediately after the completion of major works related to the ring road and radials.
    - **Development of terminals and depots** proposed in the Master Plan.
    - Provision of **bus bays and stops**.
    - **Increase the number of pickup points** from 5 to 30 **and taxi stands** from present 50 to 75.

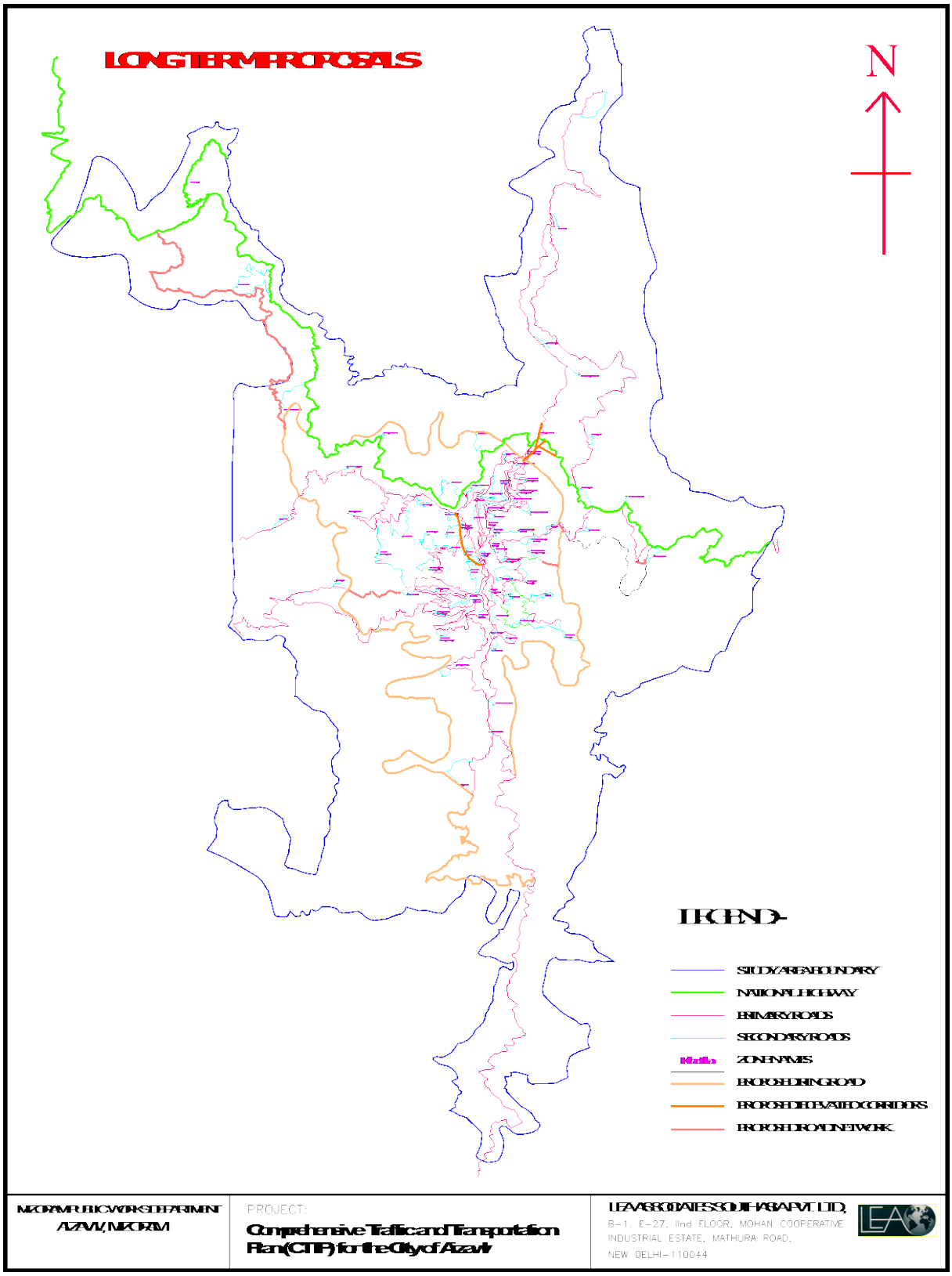


Figure 2.12: Long-term transportation proposals

Source: Aizawl Comprehensive Traffic and Transportation Plan, 2011

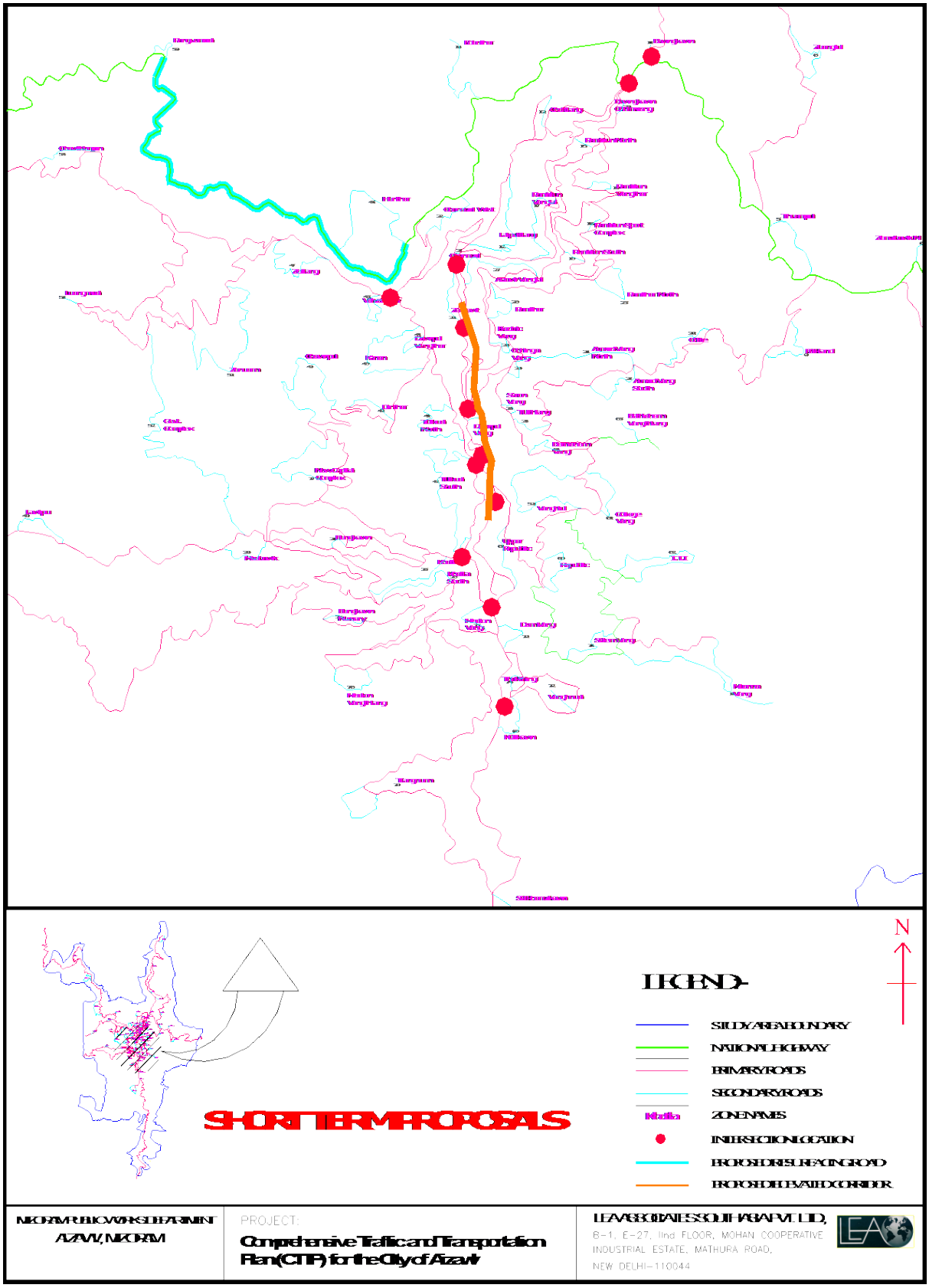


Figure 2.13: Short-term transportation proposals

Source: Aizawl Comprehensive Traffic and Transportation Plan, 2011

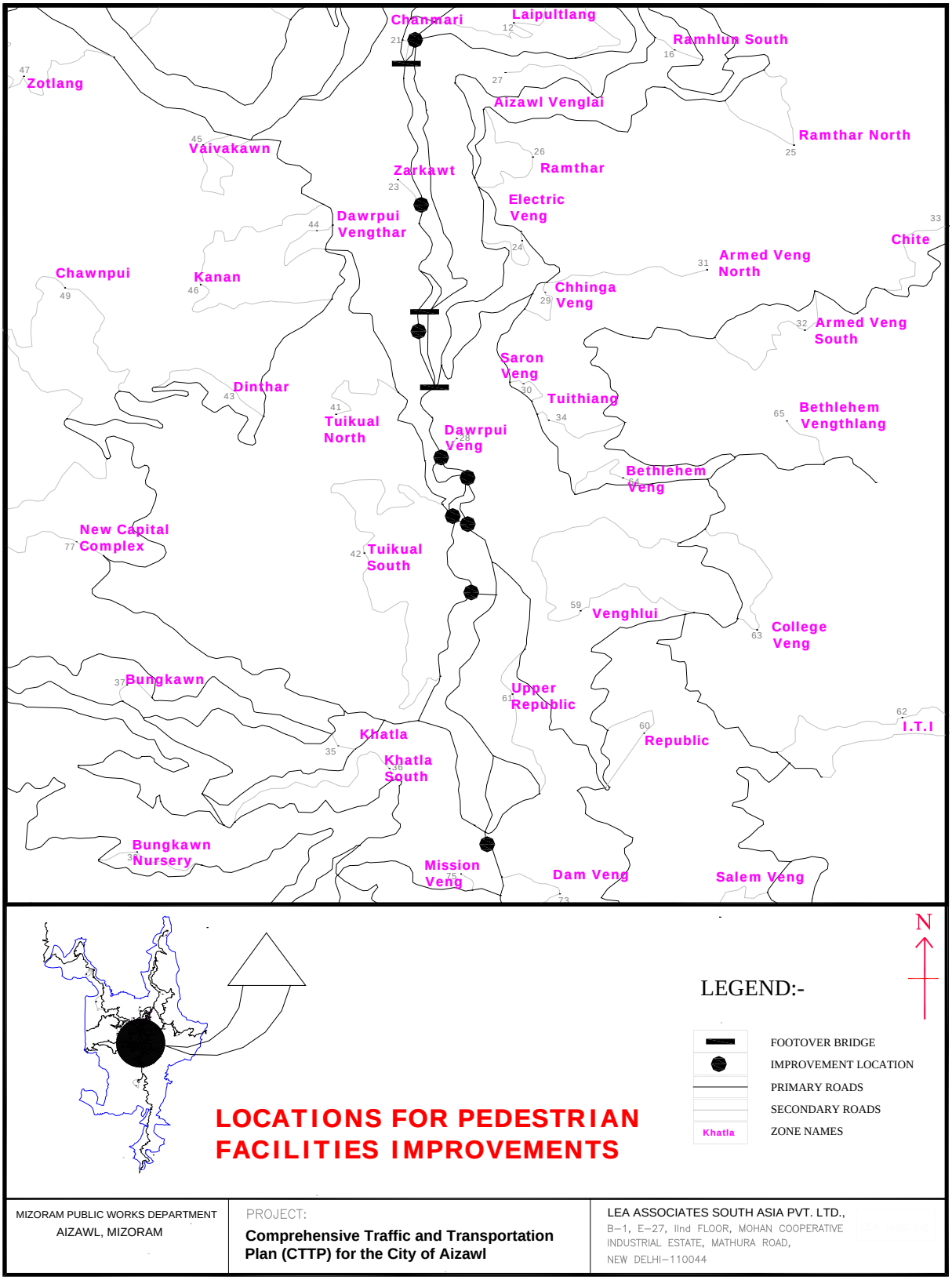


Figure 2.14: Pedestrian facility improvement proposals

Source: Aizawl Comprehensive Traffic and Transportation Plan, 2011

2.3. Legislative and Regulatory Environment

2.3.1. Mizoram Motor Vehicle Rules, 1995

The existing Mizoram Motor Vehicle Rules (refer Figure 2.15) only include regulations for motorised vehicles such as driver's licence, authority involved, registration certificate, vehicle permits etc. There are more than 8,000 taxis registered in Mizoram and 13,000 registered cars as of 2012, of which majority are on Aizawl city roads with little space to move, resulting in long queues and waiting time at intersections. A practical registration policy based on appropriate taxation can serve dual purposes of dampening the artificial demand created due to conspicuous consumption patterns while at the same time generating resources to upgrade public facilities such as footpaths, cycle tracks parking or transit etc. The tax proceeds from such measures should be specifically earmarked and used for the purpose of improving the non-motorised transport infrastructure and public transport facilities only.

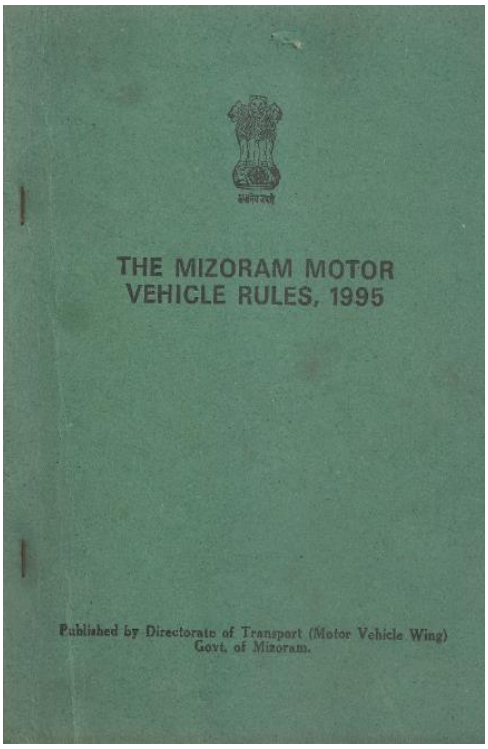


Figure 2.15: Mizoram Motor Vehicle Rules, 1995

Source: iTrans

2.3.2. Building Regulations, 2012

Development controls are designed and enforced in order to promote safe building practices, and control densities for a healthy living environment. The Aizawl City Development Controls include regulations and restrictions on height and dimensions of building, use, structural adequacy, health and safety considerations etc. It does not include regulations related to non-motorised access to buildings or requirement of pedestrian friendly infrastructure – such as uniform frontage zones, etc. Building regulations must also include measures such as no boundary walls so that there are eyes on the street that enhance safety and security etc.

2.3.3. The Mizoram Municipalities (Procedure and Conduct of Business) Rules, 2007

The Mizoram Municipalities Rules do not address planning and maintenance of pedestrian infrastructure as a distinct municipal function. It must be revised to include formation of separate non-motorised cell or department that would implement the NMT infrastructure and facilities in the city.

2.3.4. Display of Advertisement and Hoarding Regulations, 2013

These regulations (refer Figure 2.16) provide a list of type of advertisement and hoardings permitted, size, structure and per sqft rate at different locations in the city. It also provides special provision regulations allowed, procedure for grant of permission, renewal and penalty, the authorities involved etc. Under the transportation some of the regulation that are important are as follows -

- Display of advertisements at traffic junction

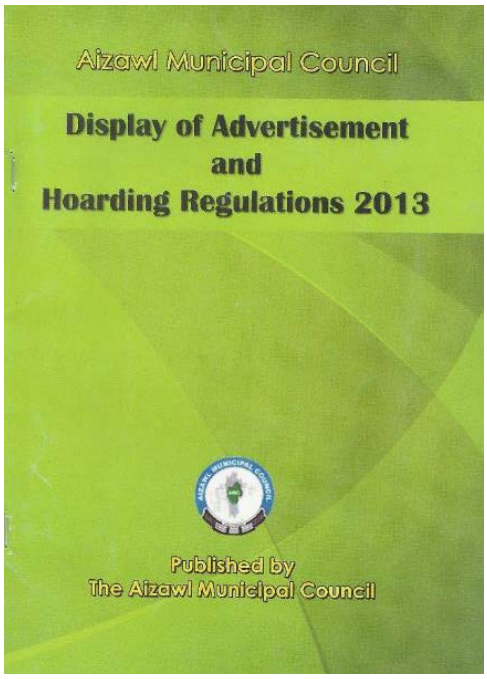


Figure 2.16: Aizawl Advertisement Regulations, 2013

Source: iTrans

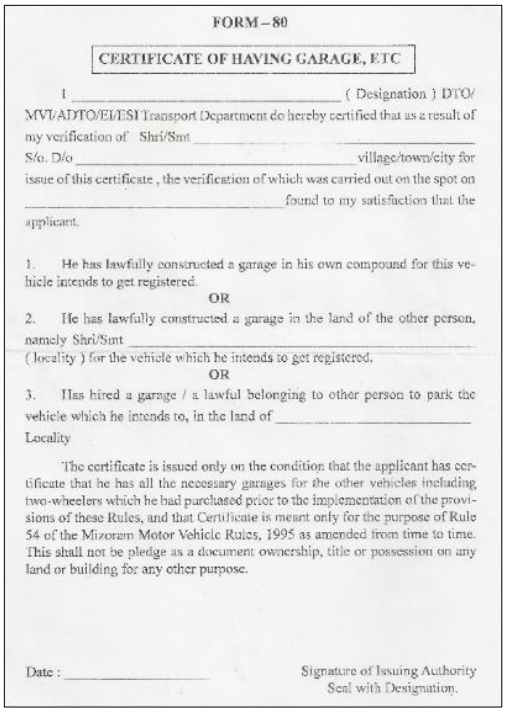
- Special provision for display of advertisement on bus stops
- Special provision for display of advertisement on vehicles
- Special provision for display of advertisement on flyover and bridge

However, regulations must also include provisions to ensure that non-motorised facilities are not obstructed by any of the display signs and hoardings. The revenue generated by advertisements should be used for implementation of non-motorised transport facilities in the city.

2.3.5. Certificate of Having Garage

Under this regulation as per the Mizoram Gazette published by the Government on 13th August, 2010, any motorised vehicle owner intending to register the vehicle, including a two wheeler, should lawfully obtain certificate (refer Figure 2.17) from the Transport Department. The certificates states that the vehicle owner has constructed a garage in his/her own compound or in the land of other person name which should be specified or hire a garage for parking the vehicle. This is an excellent initiative to deter the increase in the numbers of private vehicles in the city. There is a need to include a monitoring mechanism to ensure that this is implemented and residents do not, in practice, park on the footpaths or the streets in front of their houses.

Traffic police, with the help of Aizawl Municipal Council, is already implementing the Garage Certificate Compliance. In the first phase, all vehicles after registration number "MZ01 F 7188" are being checked for Garage Certificate Compliance.



FORM – 80

CERTIFICATE OF HAVING GARAGE, ETC

I _____ (Designation) DTO/ MVI/ADTO/EI/ESI Transport Department do hereby certified that as a result of my verification of Shri/Smt _____ S/o. D/o _____ village/town/city for issue of this certificate , the verification of which was carried out on the spot on _____ found to my satisfaction that the applicant.

1. He has lawfully constructed a garage in his own compound for this vehicle intends to get registered.

OR

2. He has lawfully constructed a garage in the land of the other person, namely Shri/Smt _____ (locality) for the vehicle which he intends to get registered.

OR

3. Has hired a garage / a lawful belonging to other person to park the vehicle which he intends to, in the land of _____ Locality

The certificate is issued only on the condition that the applicant has certificate that he has all the necessary garages for the other vehicles including two-wheelers which he had purchased prior to the implementation of the provisions of these Rules, and that Certificate is meant only for the purpose of Rule 54 of the Mizoram Motor Vehicle Rules, 1995 as amended from time to time. This shall not be pledge as a document ownership, title or possession on any land or building for any other purpose.

Date : _____

Signature of Issuing Authority
Seal with Designation.

Figure 2.17: Sample certificate of having garage

Source: Transport Department, Aizawl

2.3.6. Addressing Regulatory Barriers to NMT

The planning documents, legislations and regulations need to be amended to support NMT supportive development in the city. Some actions that could be proposed in the plans and regulations to help improve conditions and encourage the use of non-motorised transport are as follows:

- Propose area specific NMT improvements in the Master Plan so that they are statutory.
- Integrate hawkers/informal sector with street design in the Master Plan.
- Constitute an NMT cell within the structure of the Aizawl Municipal Council.
- Implement intelligent mechanisms to integrate all utilities with NMT infrastructure.
- Improve public stairs to improve connectivity and accessibility for pedestrians. These can be designed to reduce the distance between the places and develop shorter walk-able paths (This should be looked into greater detail in the NMT network proposal).
- Use revenues collected under the Motor Vehicles Act for provision and upgradation of NMT facilities.
- Consider usage of revenues collected from public advertising for NMT projects. Special provisions for advertisements on bicycles should be included which could be required for a Public Bicycle Sharing System (PBS) system proposal in the future.
- Strictly enforce the "Certificate of Having Garage".

2.4. Transport and Infrastructure

2.4.1. Regional Linkages

Air connectivity to Aizawl is provided by Lengpui Airport, situated near Aizawl, and connected to the city by NH 54. Flight connection to Aizawl exist from Kolkata's Netaji Subhash Chandra Bose International Airport and Guwahati Airport and flight duration is approximately 1hour 45 minutes. The entry to Aizawl from the airport via Vaivakawn is extremely narrow and has very poor road geometry. Access to the airport from NH-54 via Bawngkawn results in a extensive detour, which is especially circuitous for people traveling to the central and southern parts of the town. New entry points to facilitate easy access from NH-54 to all planning zones are needed.

By road, Aizawl is connected through three national highways. NH 54 connects Lunglei, Sikhar, Kolasib, NH 44 connects Mamit and Manu and NH 150 connects Churachandpur. Most of the regional road links pass through the congested urban street network of the town. This causes interference to both regional and local traffic movements. This could be addressed by a comprehensive system of bypasses and ring roads to segregate regional traffic from intra-urban movement. The Comprehensive Traffic and Transportation Plan (CTTP) 2011 proposes a network of ring roads that would bypass the city.

A few road stretches that function as both local and regional linkages (e.g. from Bawngkawn to Zemabawk) have experienced significant growth of automobile servicing and repairing activities. This has resulted in obstructive unorganised on-street parking of large regional buses as well as trucks. This interferes with local and regional traffic movement. Some warehousing and storage functions have also come up along these stretches. As topographical conditions do not offer any possibility of creating alternative alignments, relocation of these activities at strategic locations is crucial so as to ensure that the parked vehicles do not become a barrier to pedestrian movement.

The nearest railhead connection to Aizawl is at Silchar in Assam, approximately 184 km away. The journey from Guwahati to Silchar currently takes about 19 hrs. Buses and taxis are available from Silchar to Aizawl (6-8 hrs).

The Trans-Asian Rail (TAR) Network, promoted by United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) to provide connectivity within Asia and to Europe, is proposed to pass through Sairang city, at the foothills of Aizawl. This is expected to improve regional connectivity to Aizawl significantly and will have huge impacts on development and economy in the city. The NMT Plan must be revised as and when details on the Sairang railhead are developed and planning is underway.

2.4.2. Transport Network of the City – Road Hierarchy

The transport network of the city is complex due to constraints of the terrain. The urban road network in the core area (from Bawngkawn to Kulikawn) is densely inhabited and is typically characterised by limited and non-expandable road spaces. Most of the links have 1 travel lane in each direction – offering limited scope of movement for large vehicles like buses. Ribbon development has occurred all along the major roads with negligible scope for widening. As seen in the Table 2.4 Aizawl has about 429 km of road in the planning area. Of the total road network, only 40% of the roads have RoW more than 10m. Table 2.4 categorises the streets in Aizawl based on different RoWs. The streets lack dedicated spaces for NMT and significant part of the vehicular carriageway is generally dominated by on-street parking reducing its effective capacity. With the lack of proper drainage system, the streets are exposed to regular weathering making it further difficult to use.

Table 2.4: Length wise break up

Type	ROW in meters	Length (Kms.)	Percentage
I	Regional arterial 10m (includes few roads of 10 m and above)	170	40%
II	Urban arterial 8m (include roads 8 to 10 m)	136	32%
III	Secondary Roads 6m (include roads 6 to 8 m and roads less than 6 m wide)	123	28%
	Total	429	100%

Source: Modified based on the original map form Master Plan for Aizawl: VISION 2030, Aizawl Development Authority, 2011

The Figure 2.19 presents the road hierarchy of the planning area based on different road widths. Figure 2.20 shows typical cross sections of type I, II and III roads.

Figure 2.18: Walking facility near Bara bazar, Aizawl
Source: iTrans

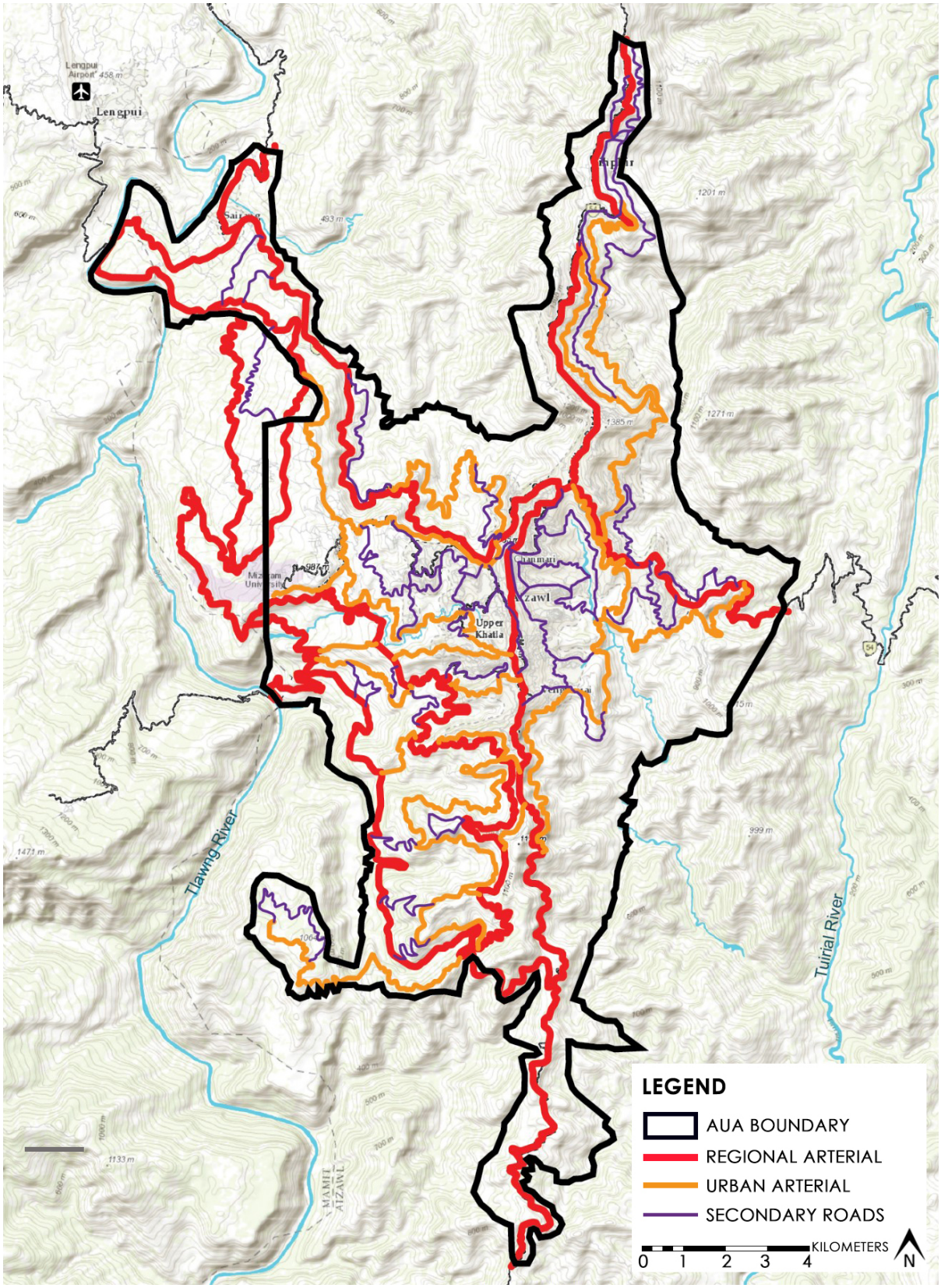


Figure 2.19: Road hierarchy of Aizawl

Source: Adapted form Master Plan for Aizawl: VISION 2030, Aizawl Development Authority, 2011

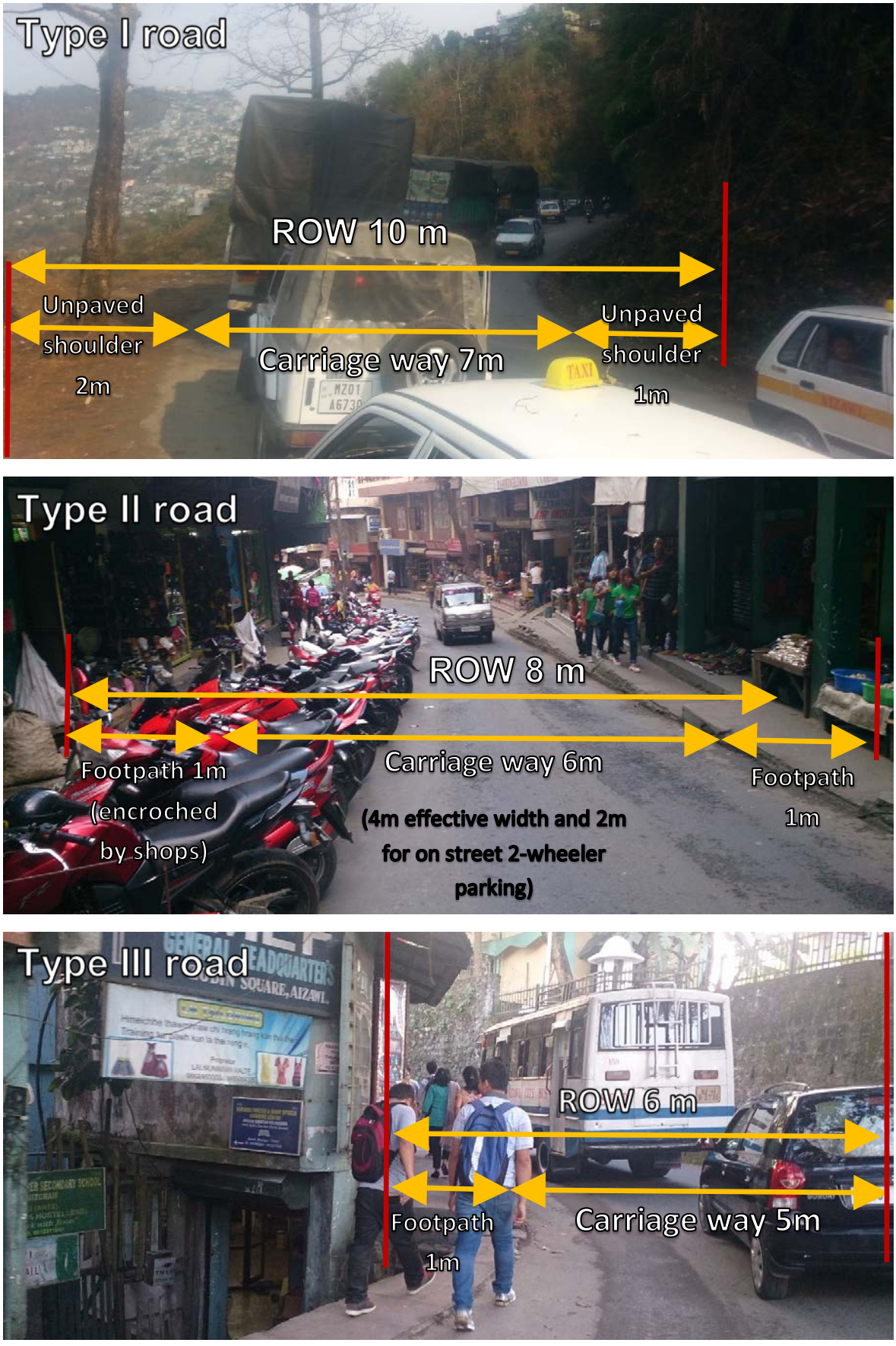


Figure 2.20: Typical cross section of Type I, II and III roads in Aizawl

Source: iTrans

The city has linearly developed along the north-south orientation (the main spine being Bawngkawn to Kulikawn). The spine has a concentration of the trip generating (high density residential functions) and trip attracting (important offices and CBD) land uses along them necessitating every intra-city travel to pass through it creating continuous congestion.

Aizawl has seen a steep increase in vehicle ownership, due to higher incomes, lack of public transit and investments in NMT infrastructure. This has overburdened the existing road network causing extreme congestion on city roads. Despite high pedestrian mode share, the city does not have an effective non-motorised transport network.

The city roads are extremely congested in the peak-hours.Table 2.5 and Figure 2.21 illustrate the congestion on the different links as identified by the traffic and transport surveys of 2007. The list of the link description in the table below is according to the order of priority. The carriage width of the link along with the peak hour traffic volume on it gives an idea of the congestion on the link. Majority of the high priority links lie in the northern central part of the city.

Table 2.5: List of road links within core areas of AUA which require immediate attention

Link Description	Carriageway Width (m)	Peak Hour Traffic Volume (PCU/Hr)
23 – 24 (Vaivakawn Market Area)	3 to 4	1,256
23 - 2 (Vaivakawn to Town Entry Point)	3 to 4	1,220
21 - 23 (Vaivakawn)	3 to 4	1,180
7 - 8 (Machhunga Point to Harimandir Intersection via Dawrpui)	7 to 8	4,584
3 - 2 (Near Hrangbana College): One Way	4 to 5	2,045
5 - 6 (Sumkhuma Traffic Point to Laldailova Point)	5 to 6	,3080
1 - 2 (Near Axis ATM): One Way	4 to 5	1,947
3 - 5 (Hrangbana College to Sumkhuma Traffic Point)	5 to 6	2,805
Za Sanga Point (19) to Selesih via Sihphir	3 to 4	850
11 - 17 (Zothasanga Point to Maenga Point)	7 to 8	3,488
Vaivakawn (24) to FCI Godown/Jail Area (22)	4 to 5	1,429
4 - 3 (Near Hrangbana College): One Way	5 to 6	2,109
1 - 4 (UTI Crossing to Hrangbana Traffic Point): One Way	5 to 6	2,036
7 - 6 (Machhunga Point to Laldailova Point via Millennium Center): One Way	6 to 7	2,473
24 - 25 (Vaivakawn Market Area to Aizawl Temple Crossing)	4 to 5	1,198
1 - 18 (Axis ATM to Kapthanga Point)	5 to 6	1,570
18 - 19 (Kapthanga to Za Sanga Point)	7 to 8	2,250
15 -Khatla Bazaar Area to New Capital Complex	5.5 to 6	1,450
16 - 25 (Ztu Kamlova Point to Aizawl Temple Crossing)	7 to 8	2,066
9 - 10 (Dr. C Thanthianga Point to Brig. C Vankunga Point)	8 to 10	2,336
6 - 7 (Laldailova Point to Machhunga Point via Bara Bazaar): One Way	7 to 8	1,933
10 - 11 (Brig. C Vankunga Point to Zothasanga Point)	10 to 12	2,799
17 - 12 (Maenga Point to R. Lalzuava Point)	6 to 10	2,017
8 - 9 (Harimandir Intersection to Dr. C Thanthianga Point): One Way	7 to 8	1,830
14 - 16 (Zokaithanga Point to Ztu Kamlova Point)	6 to 7	1,543

Link Description	Carriageway Width (m)	Peak Hour Traffic Volume (PCU/Hr)
19 - 20 (Za Sanga Point to MULCO Intersection)	7 to 8	1,670
25 - 9 (Aizawl Temple to Dr. C Thanthianga Point): One Way	6 to 7	1,439
12 - 14 (Lalzuava Point to Zokaithanga Point)	6 to 7	1,354
Intersection 4 to Bara Bazaar Area	4 to 5	685
Zuangtui Intersection to RIPANS Area along NH-54	6 to 7	1,309
Intersection 21 to Lengpui Airport	7 to 8	1,316
12 - 13 (R. Lalzuava Point to Kulikawn)	6 to 7	1,133
14 - 15 (Khatla Bazaar Area)	8 to 10	1,560

Source: Aizawl Comprehensive Transit and Transportation Survey Report, 2007

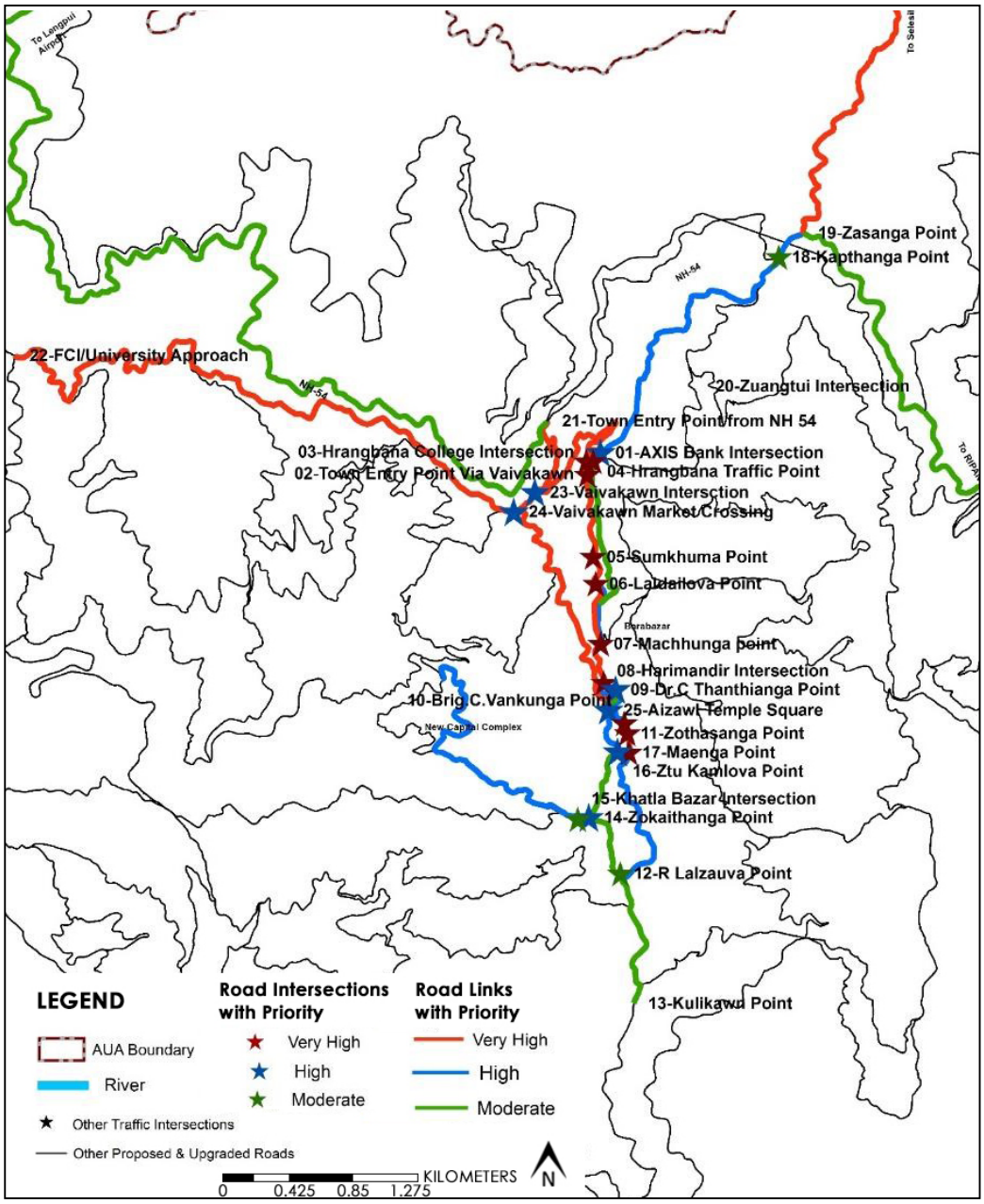


Figure 2.21: Links and Intersections that require immediate action

Source: Adapted form Master Plan for Aizawl: VISION 2030, Aizawl Development Authority, 2011

2.4.3. Transport Systems Available – PT & IPT

Small capacity **buses** are the only public transit facility (refer Figure 2.22) available for intra-urban movement and they are primarily available along few links of the road network. Nearly 1/4th of work trips and educational trips are made by public transit facilities. Access to public transit facilities is mostly by walking. Passenger loading/unloading from these vehicles as well as parking takes place within the carriageway – obstructing the vehicular traffic in most cases. At present, the operation is in the hand of private operators who prefer routes where trip density is favourable and transit patronage is high. The Figure 2.23 shows the location of existing bus terminals in the city.

Regional transit movement is through buses which ply from specific terminal facilities i.e. Aizawl Temple Square Stand and Thuampui Bus Stand. Improvements in terminal capacity as well as provision of passenger facilities are the major issues of concern. Several para-transit carriers also cater to the regional passenger traffic demand – particularly operating during the night from city centre.

Figure 2.22: City bus service in Aizawl

Source: iTrans

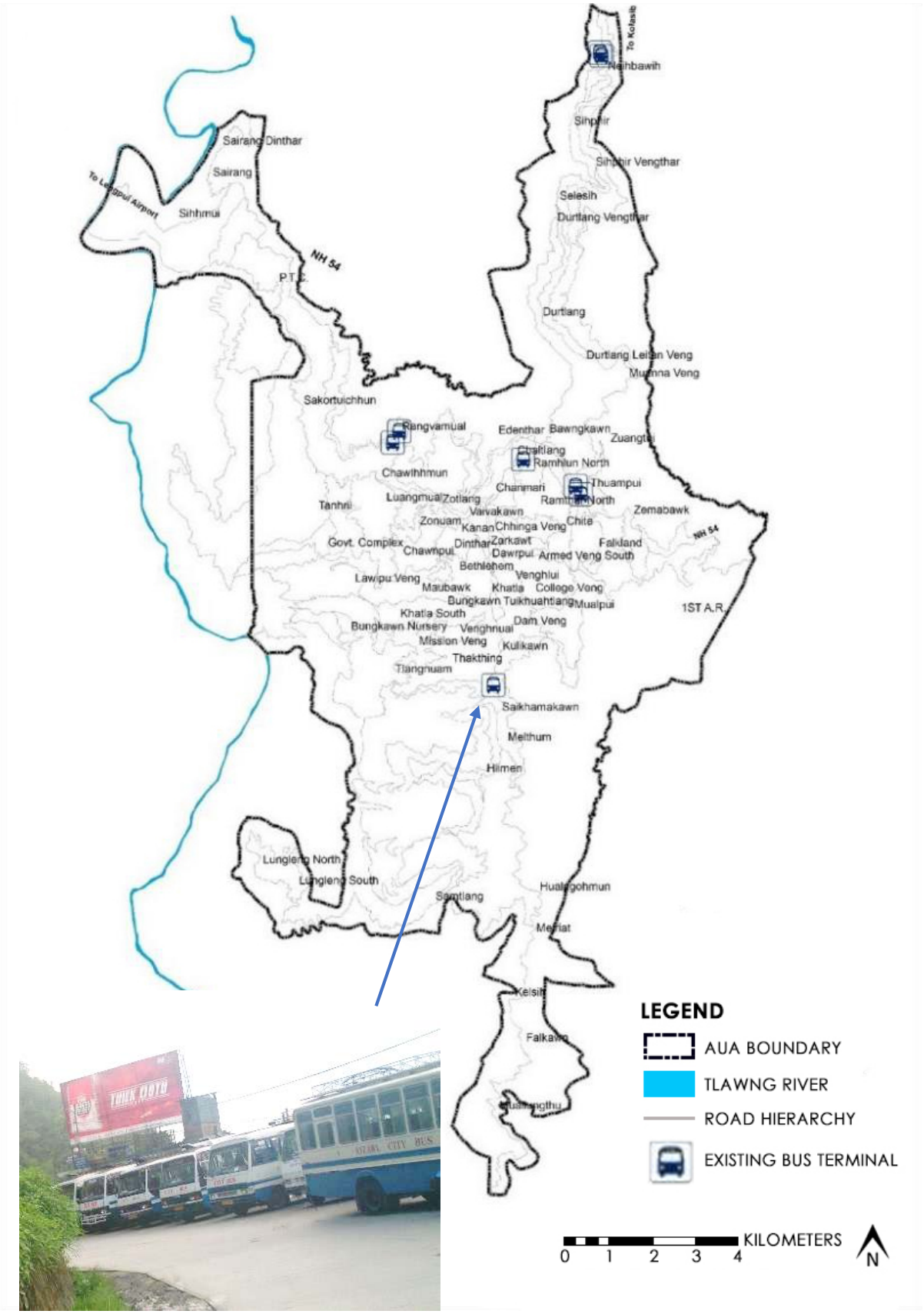


Figure 2.23: Existing bus terminals in the city

Source: Adapted from Master Plan for Aizawl: VISION 2030, Aizawl Development Authority, 2011

Taxis are the main para-transit modes (refer Figure 2.24) for intra-city movement – mostly used for work, market and medical trips. Taxi parking along the carriageway as well as low occupancy of these taxis is one of the major contributors to the congestion, particularly within the core area. **The taxi service sector is completely unorganised and needs immediate attention for improvement.**

Figure 2.24: Taxi service in Aizawl
Source: iTrans

2.4.4. Pedestrian Mobility

Large pedestrian traffic volume is also observed along the links and intersections within the core areas. Following are the reasons for such huge pedestrian volume -

1. Shorter trip length
2. Lower spending power – thus, a section is captive to walking
3. Low trip time in comparison to waiting time for public transit
4. Unavailability/greater search time for parking of car/two-wheeler
5. Usage of steps to reduce the travel distance further
6. Favourable climate

The Table 2.6 comments on the kind of pedestrian facilities available on the different links in the city of Aizawl.

Table 2.6: Important links requiring improvement in pedestrian facilities within AUA

Link No.	Link Description	Present Pedestrian facilities	Priority of intervention
1 to 2	Near Axis ATM	Present at certain stretches, 1.2 m footpath on one side	Moderate
1 to 18	Axis ATM to Kapthanga Point	Present at certain stretches, 1.2 m footpath on one side	Moderate
18 to 19	Kapthanga Point to Za Sanga Point	Absent	High
19 and beyond	Za Sanga Point to Selesih via Sihphir	Absent	Moderate
19 to 20	Za Sanga Point to MULCO	Present at certain stretches,1.2	Moderate

Link No.	Link Description	Present Pedestrian facilities	Priority of intervention
	Intersection	m footpath on one side of the road stretch	
20 and beyond	MULCO Intersection to RIPANS Area along NH-54	Absent	Moderate
18 to 21	Westwards from Kapthanga point along the NH-54	Absent	Moderate
21 and beyond	Intersection 21 to Lengpui Airport	Absent	Low
21 to 23	Vaivakawn	Present at certain stretches,1m footpath at certain stretches	High
23 to 2	Vaivakawn to Town Entry Point	Absent	Moderate
23 to 24	Vaivakawn Market Area	Absent	Very High
4 to Barabazaar	Intersection 4 to Barabazaar Area	Absent	Very High
24 to 22	Vaivakawn to FCI Godown/Jail Area	Absent	Moderate
24 to 25	Vaivakawn Market Area to Aizawl Temple Crossing	Absent	Very High
25 to 9	Aizawl Temple to Dr. C Thanthianga Point : One Way	Footpath at certain stretches, varying width	Very High
3 to 2	Near Hrangbana College : One Way	Absent	Very High
1 to 4	Axis Crossing to Hrangbana Traffic Point : One Way	Footpath at certain stretches, varying width	Very High
4 to 3	Near Hrangbana College : One Way	Present at most of the stretch,1.2 m footpath on both sides of the road	Very High
3 to 5	Hrangbana College to Sumkhuma Traffic Point	Footpath present at certain stretches, varying width	Very High
5 to 6	Sumkhuma Traffic Point to Laldailova Point	Present at most of the stretch,1.5 m footpath on both sides of the road stretch	Very High
6 to 7	Laldailova Point to Machhunga Point via Barabazaar : One Way	Present at most of the stretch,1.5 m footpath on both sides of the road stretch	Very High
7 to 8	Machhunga Point to Hari Mandir Intersection via Dawrpui	Present at most of the stretch,1.5 m footpath on both sides of the road stretch	Very High
10 to 11	Brig. C Vankunga Point to Zothasanga Point	Absent	Very High
9 to 10	Dr. C Thanthianga Point to Brig. C Vankunga Point	1.5 m footpath all along one side of the road stretch	Very High
8 to 9	Hari Mandir Intersection to Dr. C Thanthianga Point : One Way	1.5 m footpath all along one side of the road stretch	Very High
11 to 17	Zothasanga Point to Maenga Point	Absent	Very High
17 to 12	Maenga Point to R. Lalzauva Point	Footpath present at certain stretches, varying width	Very High

Link No.	Link Description	Present Pedestrian facilities	Priority of intervention
12 to 13	R. Lalzauva Point to Kulikawn	Footpath present at certain stretches, varying width	Moderate
13 and beyond	Kulikawn Intersection to Kulikawn Bus Stand	Absent	Low
12 to 14	Sikulpuikawn Intersection to Zokaithanga Point	Footpath present at certain stretches, varying width	Moderate
14 to 15	Khatla Bazaar Area	Present at most of the stretch, 1.5 m footpath on both sides of the road stretch	High
15 and beyond	Khatla Bazaar Area to New Capital Complex	Absent	Moderate
14 to 16	Zokaithanga Point to Ztu Kamlova Point	Footpath present at certain stretches, varying width	Very High
16 to 25	Ztu Kamlova Point to Aizawl Temple Crossing	Footpath present at certain stretches, varying width	Very High
7 to 6	Machhunga Point to Laldailova Point via Millennium Centre : One Way	Present at most of the stretch, 1.5 m footpath on one side of the road stretch	Very High
7 to 18	Machhunga Point to Kapthanga Point via Electric Veng/Ramhlun	Absent	Very High

Source: Aizawl Transit and Transportation Survey Report, 2007

Typically, the areas of high pedestrian movement (refer Figure 2.25) in the city are also the areas of high vehicular movement and areas of on street parking demand. This gives rise to intense conflict of space between the non-motorised and the motorised traffic that is further exacerbated by the narrow roads. In many areas where this conflict is particularly intense, like the Vaivakawn area, Barabazaar and others, the footpaths have been completely wiped out.

Figure 2.25: Heavy pedestrian movement in Bara bazaar area in Aizawl

Source: iTrans

Walk is an essential and sustainable mode in any transport system, especially so in context of Aizawl. With paucity of road space and the geographical constraints in creating links, the high share of walking is the only solution for managing mobility in the city. It is essential and desirable to maintain and upgrade pedestrian facilities such that the people are encouraged to walk at least for shorter distances and the mode share of walk trips is maintained.

However, most of the links do not have adequate footpaths on both sides to accommodate the high pedestrian volume – forcing them to move along the carriageway. Low traffic speed within the city significantly reduces the probability of accident in spite of very high level of pedestrian vehicular conflict.

An important part of the mobility network in Aizawl are the flights of steps (refer Figure 2.26) connecting parallel roads at different levels. The steps are critical to the pedestrian mobility network, creating walking shortcuts that ensure that walking trip distances remain shorter than the vehicular trip distances. They provide safe paths for pedestrians and are often lined by a variety of shops and vendors. However, these steps are often in bad condition. The major deficiencies are:

1. Inadequate/irregular riser and tread
2. Poor surface condition
3. Poor illumination
4. Lack of railing and landing facilities for long flight of steps

Figure 2.26: Busy public stairs in Aizawl

Source: iTrans

2.4.5. Other City Specific Challenges for Pedestrians and Cyclists

Hilly terrains like Aizawl pose special problems for walking and cycling because of the slopes and the constrained spaces. However, there are additional issues that make the provision of pedestrian friendly infrastructure a challenge. One of them is that the slopes and steps (refer Figure 2.27 and Figure 2.28) make it difficult for the city to be universally accessible. The elderly, differently abled (people on wheel chairs and tricycles, the blind), and people with other physical challenges will find the city difficult to navigate. The steps, the shortest path and safest paths for pedestrians, are impossible for the physically challenged. Hence, it is critical that all footpaths, along the roads are made **universally accessible.**

Figure 2.27: Typical view of the staircase network in Aizaw
Source: iTrans

Figure 2.28: Steep public stair linkages lined with shops
Source: iTrans

The constrained road space and the narrow steps, have several users. Important amongst them are the **street vendors** (refer Figure 2.29 and Figure 2.30). Street vendors form extension of markets on most of the commercial street, and most of their customers are the pedestrians walking by them. However, they also become a hindrance to pedestrians by claiming the space on footpaths and shoulders that are already marginal, leaving little space for effective pedestrian movement. But instead of eliminating them from the street, they should be considered as an important part of the whole street design by providing them designated spaces. These street vendors are an important part of the vibrant streets of Aizawl.

Figure 2.29: Street vendors in Aizawl encroaching on footpath space
Source: Aizawl Municipal Council

Figure 2.30: Encroachments by on-street parking and street vendors obstructing NMT movement in Aizawl
Source: Adapted from CTTP, 2011

On-street parking (refer Figure 2.30) is another important challenge faced by the pedestrians on the constrained road spaces in the city. There is little organised parking supply in Aizawl. Except for a large commercial complex like the Millennium Centre, most of the parking needs are met by on-street parking. Apart from parking requirement for passenger vehicles, there is also a need to plan parking for goods' vehicles that is currently missing. The city officials have tried to earmark all available road-side space for the increasing parking demand in the city. Table 2.7 shows the effort to organise meagre space into parking lots, trying to balance between parking for cars and two wheelers, taxis, buses and freight vehicles.

The existing number of parking areas in Aizawl city for cars, two-wheelers, LMVs, Maxi cabs and HMVs has maximum capacity of 4,500 vehicles but actual demand is more than 18,000.
Source: Parking Study by AMC, 2014

Table 2.7: Proposed off-street parking locations

S No	Place	Length	Remarks
1	S.A. Hall Dawrpui Vengthar (Hauva Memorial Hall) kawm thlang.	L-20 mtrs	General Parking LMV & Two Wheelers In current plan, this area has been proposed as pedestrian only area.
2	Pi Hauziki In kil hmar lam thir ban atangin hmar lamah Pu H.V.L. Auva Building chhim lam thleng.	L-67 mtrs	Dropping Zone
3	Abiel Automobile opposite thir ban atangin hmar lamah Water Pump thleng.	L-27.5 mtrs	6 LMV
4	Pu Thanghuama in kawt kawng chhak lam zau lai.	L-15 mtrs	3 LMV
5	Pu Lalthansanga Sailo in kawt kual zau lai.		Dropping Zone
6	Pu Romawia in kawt YMA Zun In ban atangin Vaivakawn lamah, thingkung thleng.	L-53 mtrs	12 LMV
7	A chunga sawi atangin hmar lam Vaivakawn kawn lamah N.S.S. H.B.C. Zun In ban thleng.	L-71 mtrs	20 Taxis
8	Vaivakawn YMA Library Building huam chin.	L-12.7 mtrs	12 Two Wheelers
9	A chunga sawi Two Wheelers Parking atangin Bazar Building huam chin.		Dropping Zone
10	Pu W. Chhuanawma in kawt Zun In atangin.	L-20 mtrs W-9 mtrs	City Bus Stand

S No	Place	Length	Remarks
11	A chunga sawi Zun In atangin Zotlang peng bul No Parking ban thleng.	L-27.5 mtrs	6 LMV
12	Khawtini Building chhak Tuikhur atangin Pu Laltinkhuma Sailo In kawt Tuikhur thleng.	L-39 mtrs	7 Pick Up
13	A chunga sawi Tuikhur atangin Zohnuai peng thleng.	L-208 mtrs	5 LMV

Source: Parking Study by AMC, 2014

Figure 2.31: On-street parking in Aizawl

Source: iTrans

2.5. Needs Assessment

Non-motorised transport in Aizawl comprises primarily of pedestrians. Due to the city's hilly terrain and lack of infrastructure (cycle lane, cycle parking, and public bicycles) only few people in the city cycle. Absence of proper infrastructure has limited cycling only to a recreational mode, leading to insignificant number of cyclists. Walk is the most popular mode in Aizawl, accounting for almost half of the total travel demand. However, excluding walk, minibuses account for over 50% of the trips performed while taxis over 20%. Private modes namely two wheelers and cars account for only about 21% of the total travel demand. The mode share for Aizawl can be seen in the Figure 2.32.

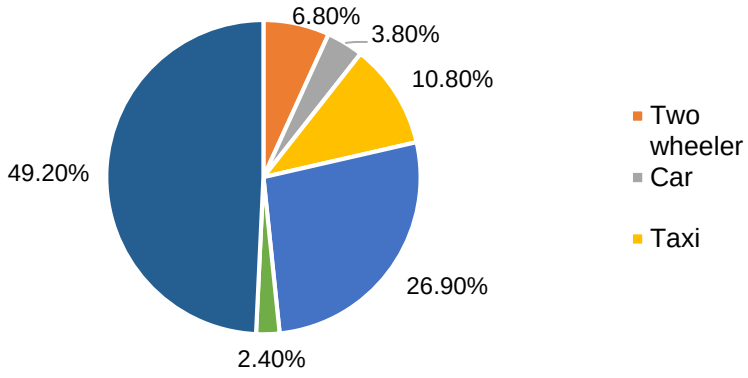


Figure 2.32: Mode share of Aizawl, 2007

Source: CTTP 2011

2.5.1. Profile of NMT Users

The city has a significant young population with nearly 60% of the population within the age group of 5-35 years. This young population creates the potential for more walking trips and also increasing use of bicycles, if safe facilities are planned on flat terrain (Refer Figure 2.33).

About 71% of households in the city earn less than INR 10,000 in a month (refer Figure 2.34). This low income may account for the current high shares of captive walkers – i.e. people who have no other choice, because other means of transport are expensive. This would also imply that the lack of pedestrian facilities would more severely affect the lower income groups. However, Aizawl cannot accommodate any increase in vehicular mode share and it is imperative to ensure that safe and comfortable walking facilities are provided to convert captive use to choice use.

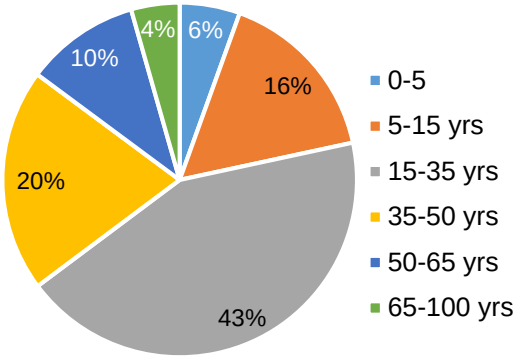


Figure 2.33: Age profile of Aizawl, 2007
Source: CTTP 2011

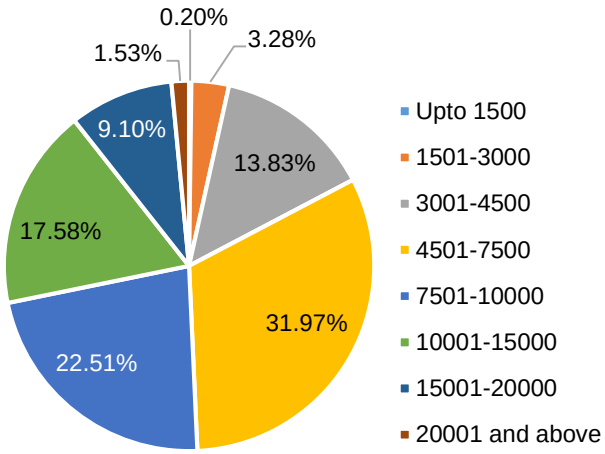


Figure 2.34: Income (in INR) distribution of Aizawl, 2007
Source: CTTP 2011

Aizawl is a small city with an average trip length of 3 km. The average trip length for walk is 0.9 km which implies that while people may be walking due to economic constraints or lack of space on roads. The potential for converting these walk trips to choice trips is latent. Average trip lengths for Aizawl by each mode can be seen in the Figure 2.35. The graph clearly indicates that buses and cars are used for the longer trips across the city, while the minibus, taxi and two-wheelers are used for regular intra-city movement and the walk trips for the shorter trips. The taxi and two-wheeler trips are within average cycling distances of approximately 4 km but the terrain would be a constraint for most.

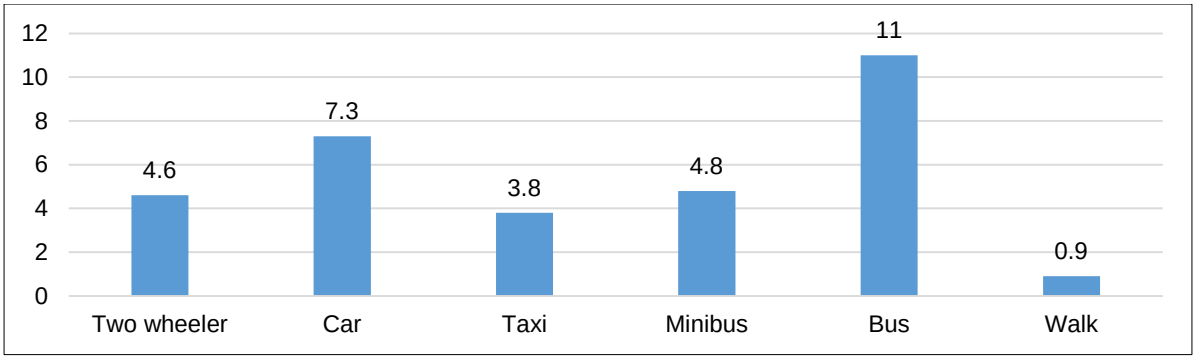


Figure 2.35: Average trip lengths (in km) of Aizawl, 2007

Source: CTTP 2011

Typically, most of the population travels either for work, business or education (refer Figure 2.36) and therefore special focus should be placed on improving NMT facilities to these destinations. Specifically, the school students (refer Figure 2.37) travelling in the city have no option but to walk longer distances or take the mini-buses. Providing safe and attractive walking and cycling facilities would go a long way in ensuring safe mobility for school students.

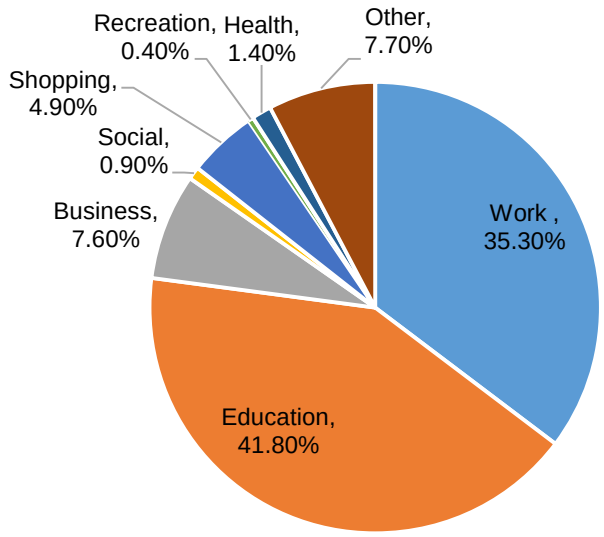


Figure 2.36: Trip purposes of Aizawl, 2007

Source: CTTP 2011

Figure 2.37: Narrow sidewalks push pedestrian movement on to the carriageway

Source: iTrans

2.5.2. Accidents, Pollution, Security

Accidents

Until 2007, Aizawl was a relatively safe city in terms of traffic accidents. With 48 accidents and 3.7 fatalities per lakh population in 2007, it had a road safety index (RSI) of 0.27, which is among the highest across all city sizes.

However, the number of accidents have been increasing since 2007. There have been 100 accidents until April in 2014 and 50% of accidents involve trucks and heavy vehicles as per the data provided by the traffic police department. Figure 2.38 shows the total accidents and number of person killed.

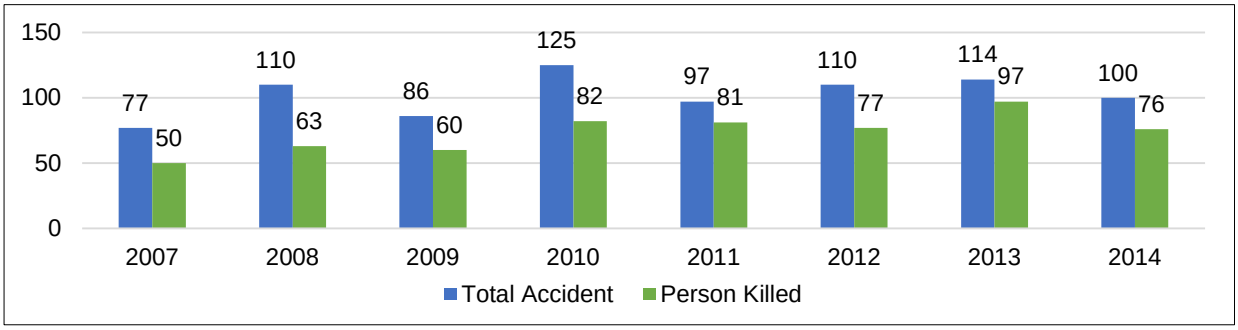


Figure 2.38: Total accidents and number of person killed (2007-2014 April)

Source: Aizawl traffic police

Most of the accidents recorded took place along the highways and regional linkages. While majority of the accidents as reported have been due to human error, the other major reasons are difficult road alignment, poor road geometry, bad road surface conditions, unstable road pavements and frequent landslides.

Safer design of footpaths and crossings along the roads is the most important intervention needed to control the increasing rate of accidents. While the urban roads are congested with vehicles in the day and there are less chances of accidents, the low volumes of traffic at night leads to increased speeds and higher number of fatalities. Adequate street lighting in the city and along the highways would go a long way towards reducing accidents in the city.

Air pollution

A study (Minda Renu, April 2008) on ambient air quality was done for the city of Aizawl at four different stations from September 2006 to June 2007. The four stations (Refer Figure 2.39) were selected based on the land use around these areas

According to the analysis it was observed that concentration of SPM, RSPM, NO2 and SO2 varied from station to station. The average concentration of SPM was found highest in Bawngkawn at 131.85 ug/m3 and lowest in MZU campus. Similarly it was concluded that the residential and commercial areas have higher SPM, RSPM, NO2 and SO2 compared to only residential areas. However, the city does not have big industries and therefore enormous increase in the number of vehicles could be assumed to be the major contributor to increasing air pollution.

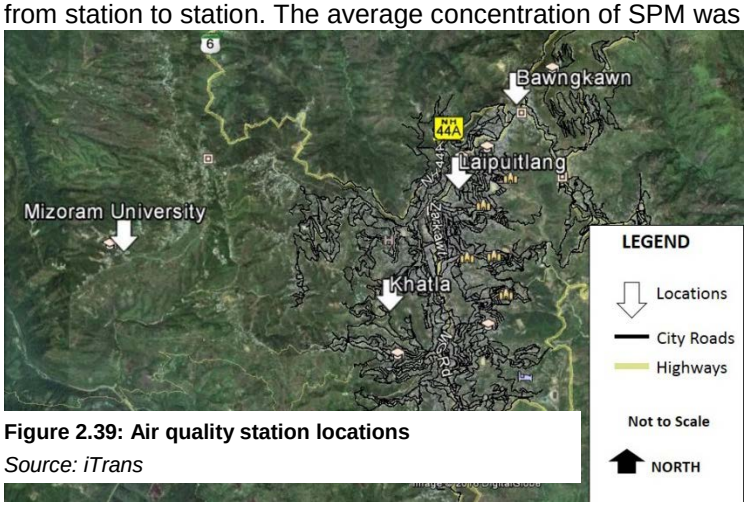


Figure 2.39: Air quality station locations

Source: iTrans

2.6. Additional Challenges and Opportunities

Based on the understanding the baseline situation in the city from the previous section, the issues and opportunities are summarised in graphical form in Figure 2.40. The main issues are **unorganised on-street vending spaces, on-street parking on main roads and the terrain of the city**. These barriers for provision of NMT infrastructure in Aizawl can be overcome with a combination of of policy, planning and design interventions, as discussed in Chapter 4 later in this report.

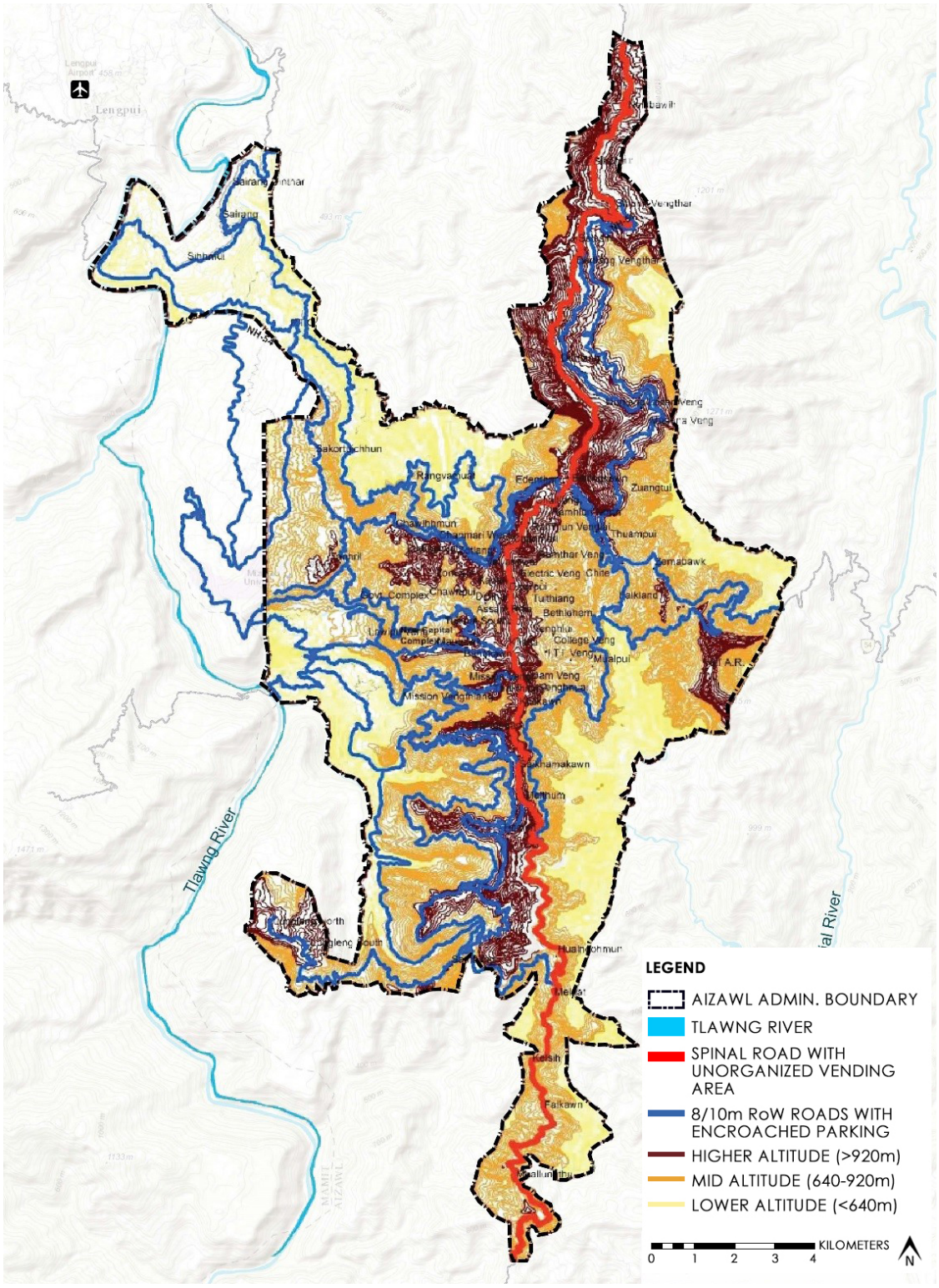


Figure 2.40: NMT issues in Aizawl

Source: iTrans

Figure 2.41 represents key opportunities for NMT improvements in the city. These include:

- **Provision of safe walking routes up to 500 meters to schools** (as schools are located within walking distance of residential areas).
- **Safe cycling routes up to 1.5km** influence area of the spine road can be developed (as these schools are located on the central spine with residential areas in the vicinity).
- **Pedestrianization of the core area** with designated parking spaces created in the vicinity of the commercial areas.
- **Creating recreational corridors** to be used by NMT users on both side of the central, relatively high altitude, spinal linkage.

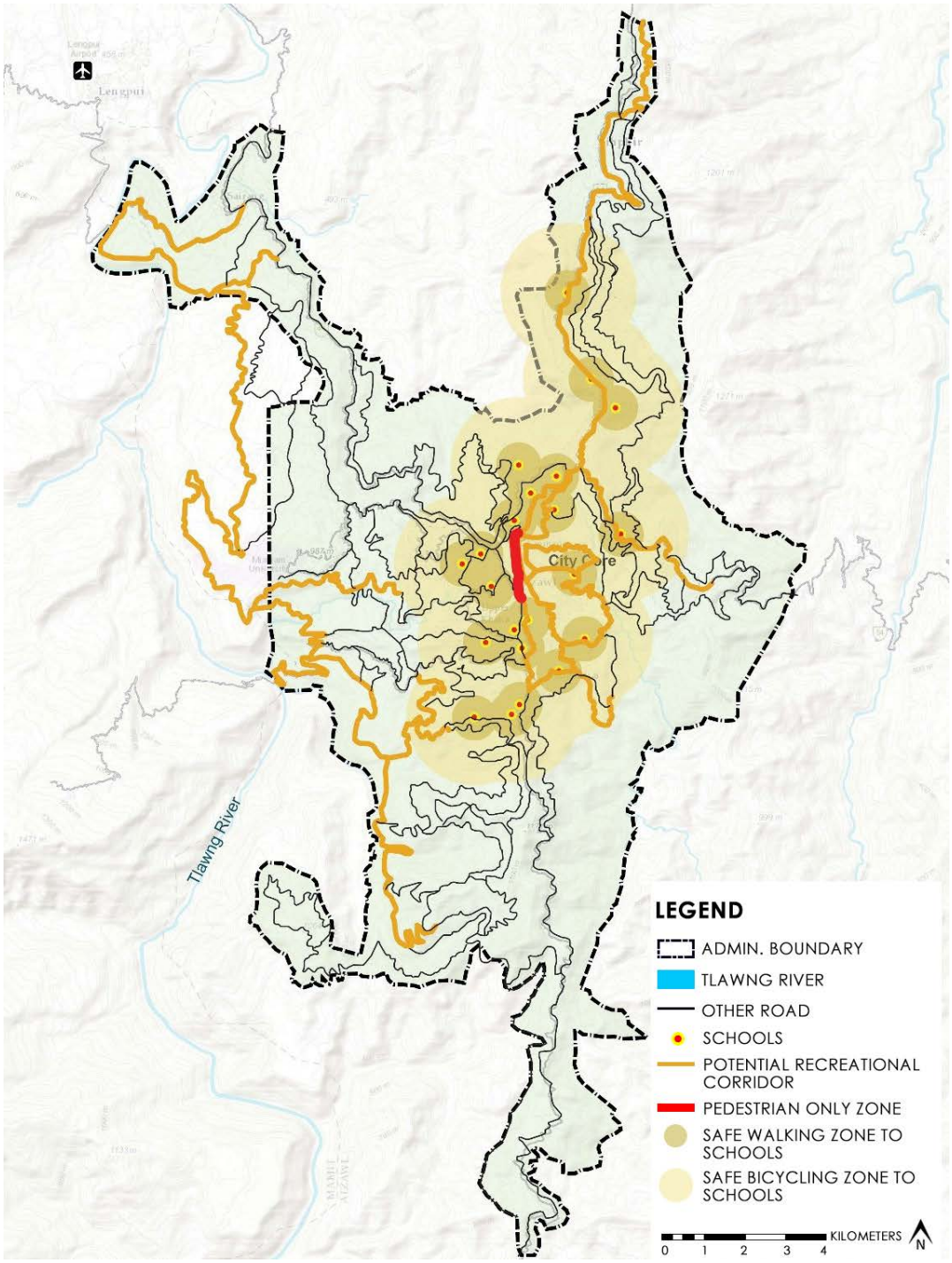
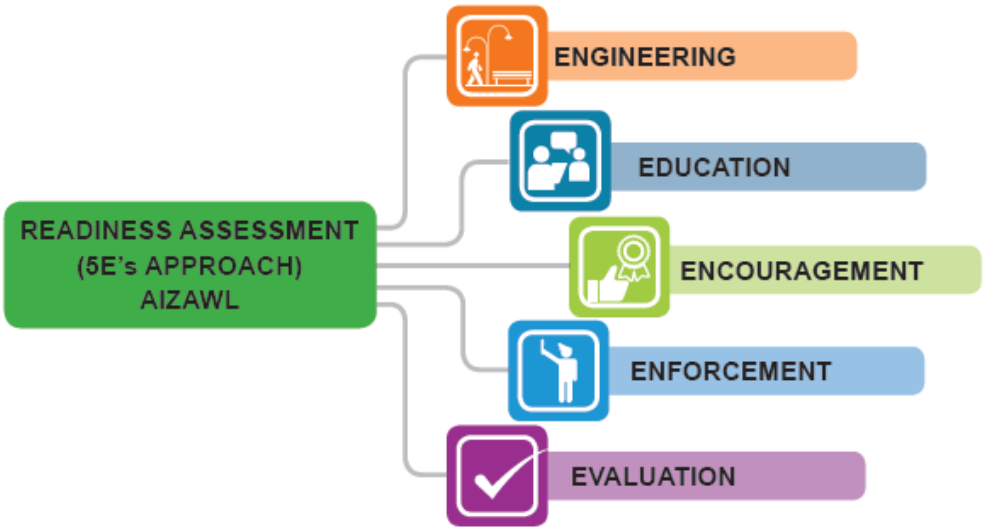


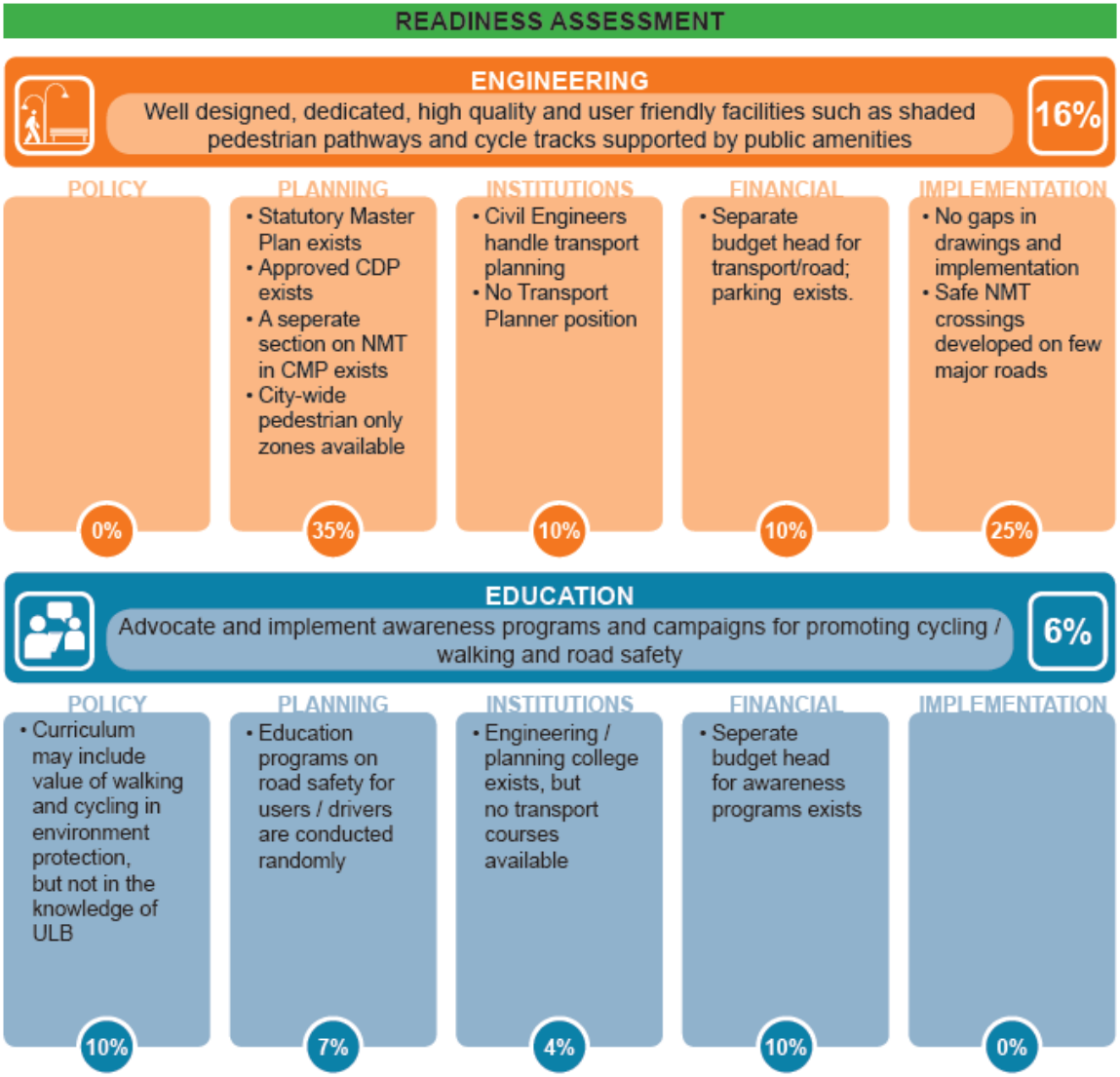
Figure 2.41: NMT opportunities in Aizawl

Source: iTrans

2.7. Readiness Assessment

Based on the Readiness Assessment as provided in the Ecomobility Readiness Assessment Report by ICLEI, the city of Aizawl was evaluated for its NMT preparedeness as defined below. (Refer Figure 2.42)





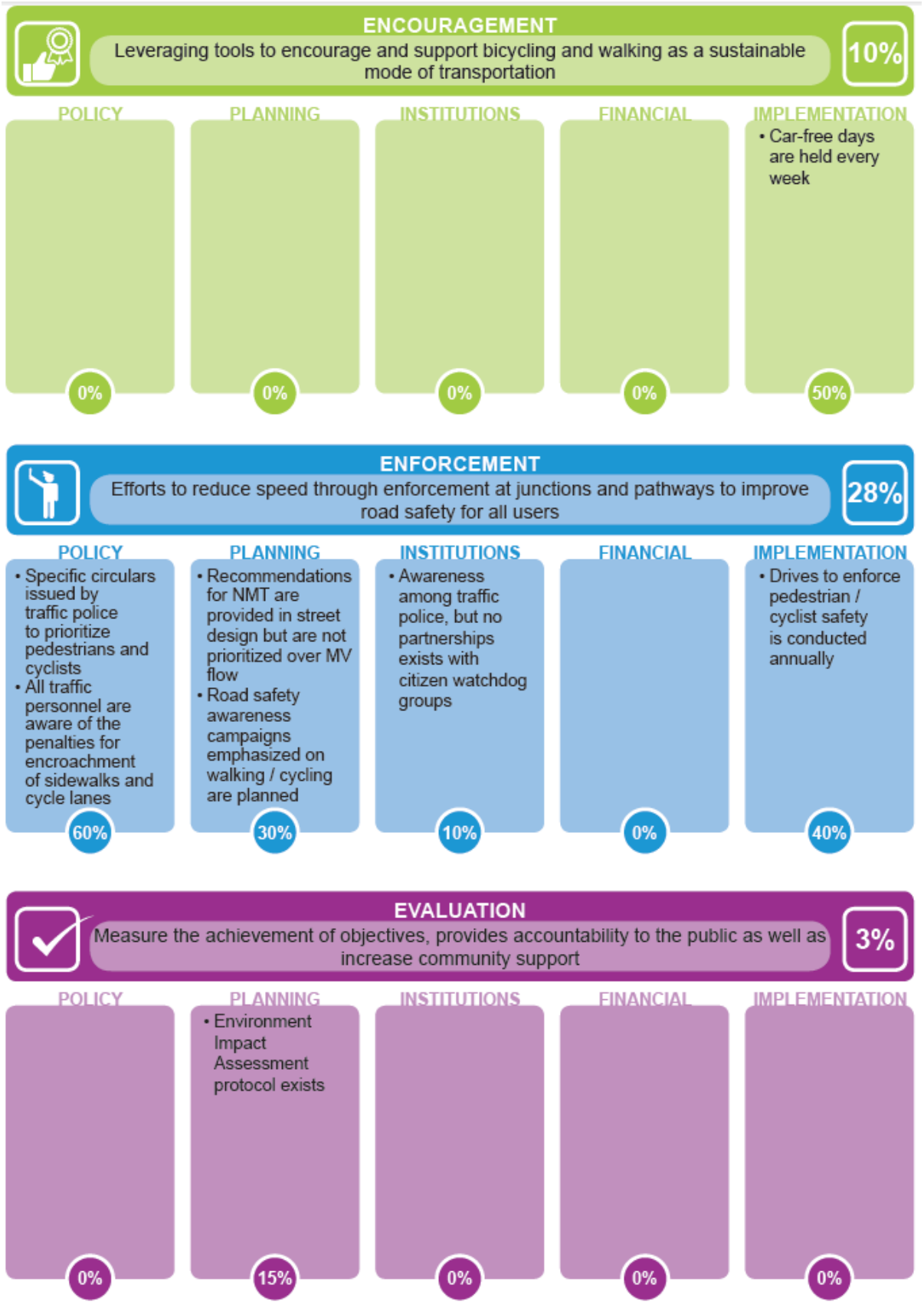


Figure 2.42: 5E for readiness assessment

Source: Adapted from Ecomobility Readiness Assessment Report by ICLEI, 2013

The results of the assessment indicated that Aizawl scores highest in enforcement compared to the other 4Es (Refer Figure 2.43). This is primarily due to the strong enforcement measures practiced in the city and the awareness of Aizawl's traffic police's initiative towards policy formulation that prioritises pedestrians and cyclists. However, due to lack of advocacy and awareness campaigns, the city scores low.

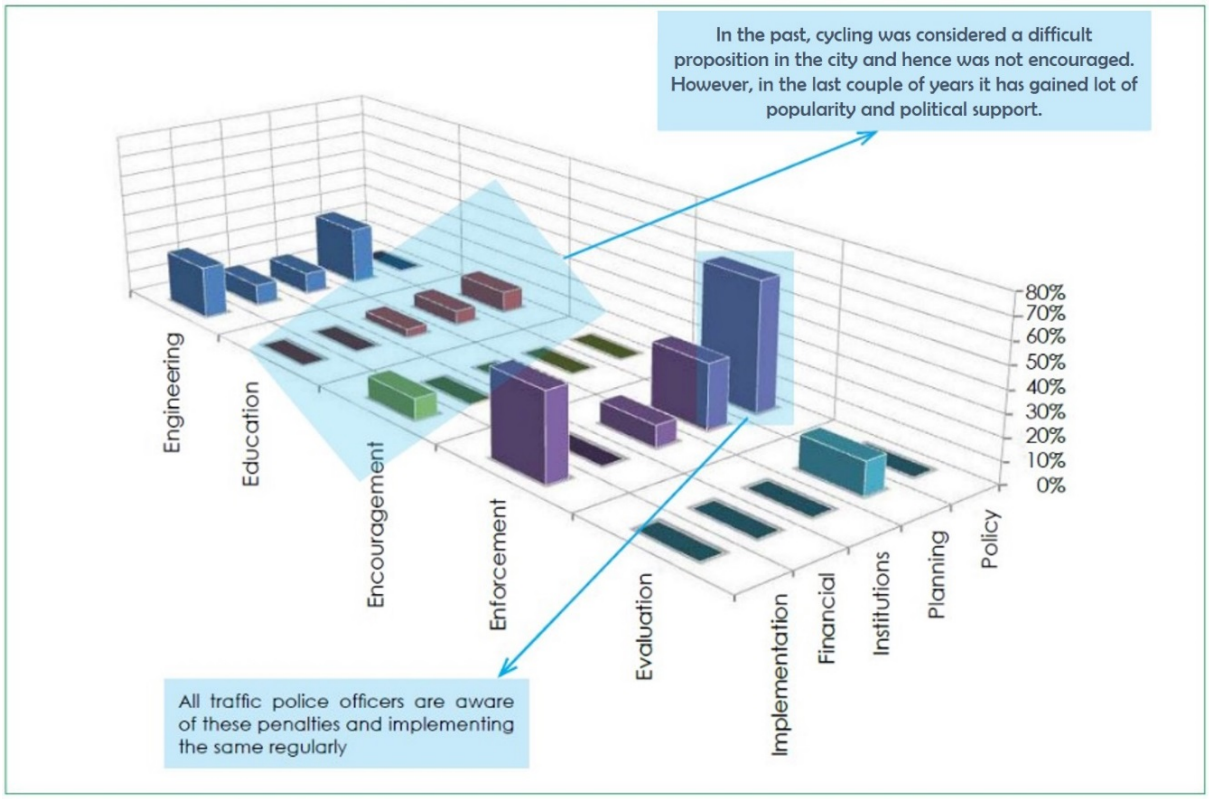


Figure 2.43: Readiness assessment performance graph of Aizawl

Source: Ecomobility Readiness Assessment, 2014, ICLEI and Shakti Foundation

2.8. Need for Non-motorised Transport Plan for Aizawl

Provision of urban transport infrastructure in Aizawl is the responsibility of the urban local body i.e., Aizawl Municipal Council, as per the 18 functions assigned to ULBs under 74th amendment of the Constitution. However, there are some systemic issues in its implementation including:

- There are multiple organizations involved in transport infrastructure provisioning and there is no structure for ensuring accountability in ownership, performance, and maintenance of transport infrastructure and systems operations. Therefore, there is a need for a single apex agency for regulating, facilitating and integrating operations of different modes.
- There are no city level guidelines existing on public transport, cycling and walking.
- There is a lack of technical expertise and adequate data on walking, cycling and public transit within the authorities for implementing urban transport projects.
- There is a lack of finance in developing and upgrading infrastructure for sustainable modes by the cities leading to deteriorating levels of service.

However, Aizawl city has very high share of NMT mode (walking) and public transport (buses and taxis) modes; and the mixed land use and high densities encourage use of these modes. These modes can be instrumental in mitigating congestion, journey delays, pollution and accidents. Therefore, there is an urgent need to tap into the potential of sustainable modes, by providing an implementation manual or business plan for the city authorities, which would provide guidance on vision and strategies for implementing, funding, and designing non-motorised transport systems. The funding can be used from the city municipal budget or other sources. This would help in achieving the sustainable goals of transport sector by retaining the existing modal share of NMT and encouraging potential commuters to use these low carbon modes.

2.9. Existing Initiatives

There is a clear recognition amongst the city authorities for the need to make Aizawl a pedestrian and cycling friendly environment. There have been some ground level initiatives taken by the traffic police to improve safety of NMT users. The most significant of these initiative is the facilitation of pedestrian road crossings by deployed traffic personnel (refer Figure 2.44) at the intersections. For example, the traffic police restricts the entry of heavy vehicles in the city during the day before 9 pm as a measure to decongest the city and to allow safer NMT mobilty.

Figure 2.44: Traffic police managing roads at busy intersection

Source: iTrans

At one of busier complex intersections in the city, a pedestrian overhead bridge (refer Figure 2.45) has been built to enable pedestrians to negotiate the crossing. While it is moderately used at peak hours when the intersection is congested, it does not get used when the volumes are low. The intersections need to be resolved for at-grade pedestrian crossings to ensure that they remain safe for pedestrians at all times of the day.

Figure 2.45: Pedestrian overbridge being used at peak hours

Source: iTrans

AMC is assessing the redevelopment of all street vending zones in the city and proposing a redevelopment plan for the same, as per the National Street Vendors Act, 2014. The objective is to rationalise the vending zones in the city. This initiative is critical to balance the needs of pedestrians and vendors in the city.

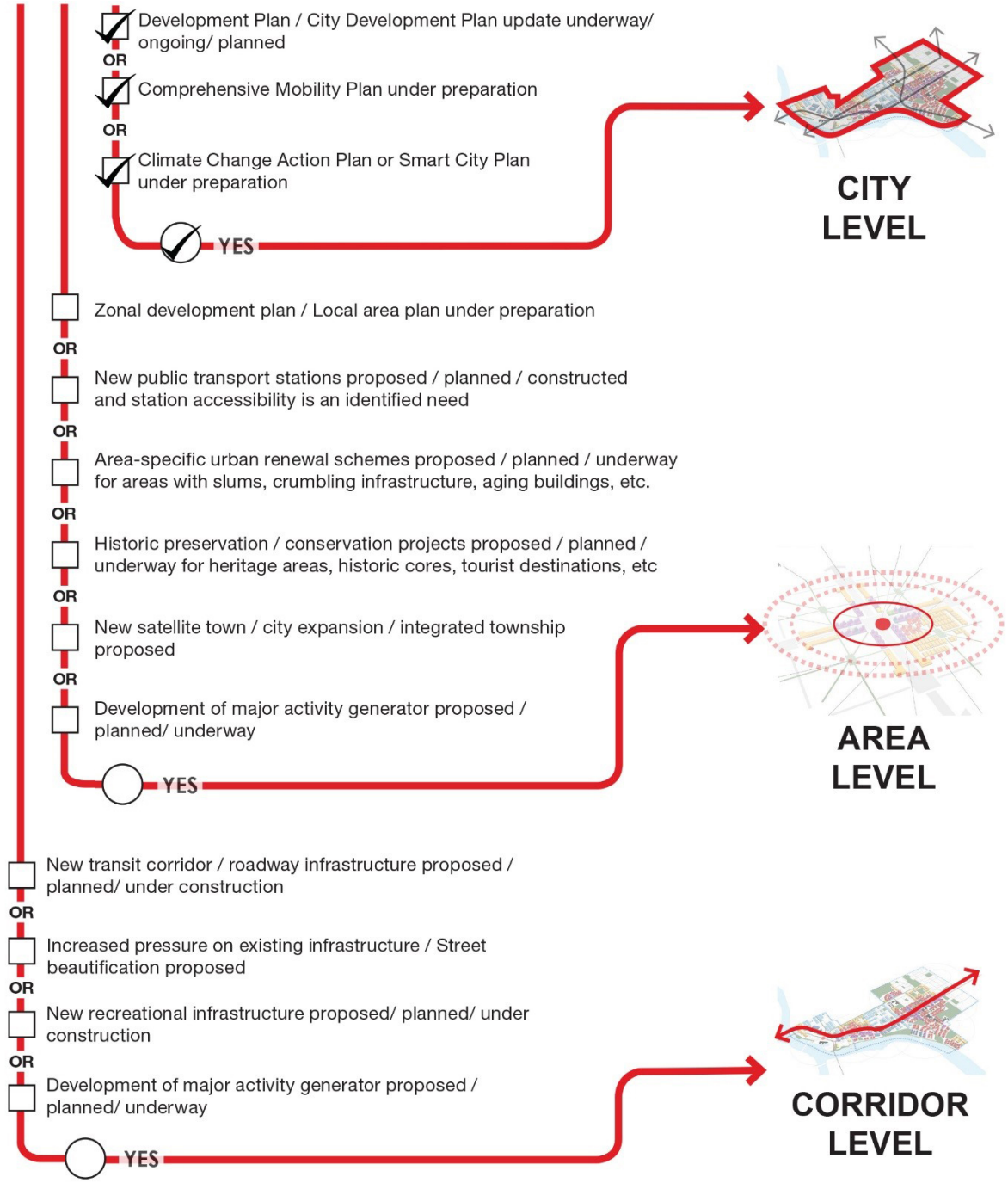
There have also been efforts to assess and rationalise parking areas in the city. It is planned to demarcate parking areas on all streets with allocated numbers and types of modes. However, this rationalization is currently purely supply driven and does not envision balancing it with the need to have footpaths and crossings, and a larger ‘complete streets’ agenda where all road user needs are taken care of.

To provide space for walking on the streets, amendment in the parking law to discourage long-term parking, and removal of on street parking in phase wise manner, is being carried out by Traffic Police with the help of Aizawl Municipal Council under the chairmanship of Honourable Chief Minister of Mizoram.

2.10. Determining the Scale of NMT Plan

This NMT Plan is developed at the city-wide scale, taking advantage of the work being undertaken for the Mobility Plan. The following tool was used to determine the appropriate scale of the Aizawl NMT Plan.

Where does your city stand on the following?



2.11. Study Area Delineation

Aizawl city has political and bureaucratic will to make changes in favour of NMT infrastructure in the city. The NMT Plan aims to build on these initiatives and recommend NMT strategies at the city-wide scale. The study area for the purposes of this Plan is defined by the Aizawl Urban Area boundaries which includes the AMC area. (Refer Figure 2.46)

Site-specific NMT proposals are also proposed in this Plan for the core city area. The core city area is delineated based on the density of population and activities. (Refer Figure 2.46)

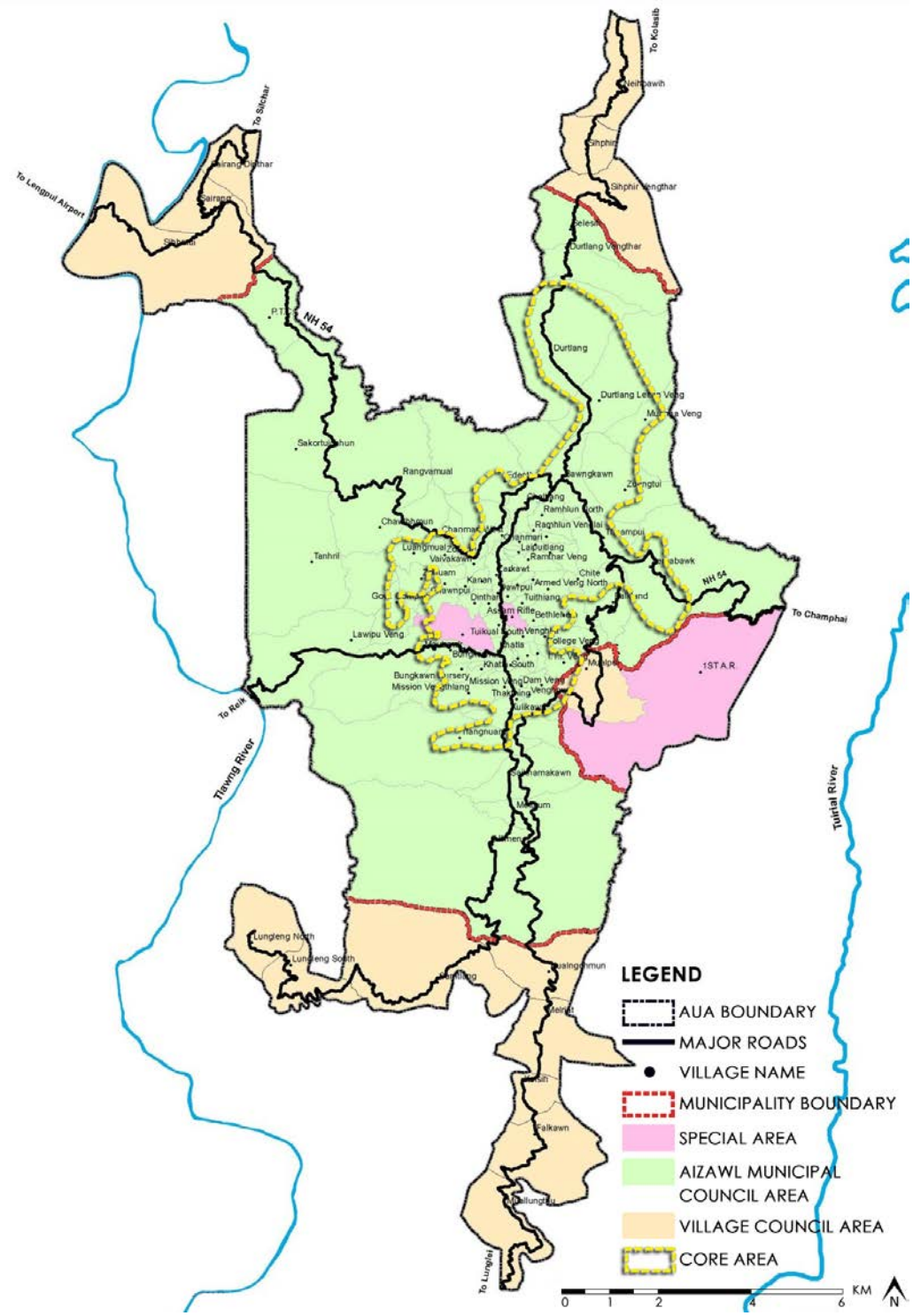


Figure 2.46: Extent of Aizawl Urban Area as study area boundary

Source: Modified based on the original map form Master Plan for Aizawl: VISION 2030, Aizawl Development Authority, 2011

2.11.1. Integrate with Planning and Decision-Making Processes

Policies and plans supporting walking and cycling need to be a part of integrated urban land use and transport discussions in the city. NMT supportive cities globally have incorporated these modes into their visions for land use planning, transport planning, spatial networks, and future developments for the city. Incorporating NMT improvements into pre-existing plans through amendments is a first step in bringing policy-level change and needs to be coherent with the vision for supporting plans such as the mobility plans, parking plan, street vendor redevelopment plan.

The traffic and transport chapter of the Master Plan of Aizawl needs to be updated to include planning for cycle and pedestrian paths, bus lanes and stops, integration with bus stops, on-street parking and taxi stands, integration of street vendors in existing right-of-ways.

To ensure integration of NMT planning with land use in new areas it is essential to include some of the design parameters in the building control guidelines of Aizawl.

2.12. NMT Stakeholder Mapping

The different stakeholders of the project include the following agencies:

- Elected representatives
- Aizawl Municipal Council (AMC) —Planning, Projects, Sanitation, Accounts, Finance Departments
- State Investment Programme Management and Implementation Unit (SIPMIU), Aizawl
- Aizawl Development Authority (ADA)
- Aizawl Traffic Police
- Department of Transport, Government of Mizoram
- Urban Development and Poverty Alleviation Department, Government of Mizoram (UD&PA)
- Mizoram Public Works Department (APWD)
- National Highway Authorities of India (NHAI)
- Town and Country Planning Organization (TCPO)
- Taxi Drivers Union
- NGOs and civic society organizations

Roles and responsibilities for policy planning, engineering design, construction administration, operations and performance monitoring are managed at different governmental levels in Aizawl. Within each level, the functions are further distributed among many agencies, with each agency carrying out a specific task and sometimes more than one agency carrying out the same task, often resulting in mismanagement. Table 2.8 describes the responsibilities of various departments for non-motorised transport that need to be further streamlined as the city progresses.

Table 2.8: Stakeholder mapping for agencies in Aizawl

Mode	Hierarchy	Planning and Policy	Infrastructure	Operations	Monitoring and Evaluation
Non-Motorised Transport	Centre		NHAI		
	State	Department of Transport, UD&PA, TCPO	Department of Transport, UD&PA,	SIPMIU	
	City	AMC, ADA, APWD	AMC, APWD	Traffic Police Private Operators/ AMC	ADA, AMC

Source: IBI Group

CHAPTER III: ENABLE

3. ENABLE

Building an enabling environment to ensure support for NMT at the decision-making level (political and executive), planning level and implementation level is critical. The Enable framework aims to:

- Identify champions to build commitment and encourage leadership to change culture and perceptions.
- Integrate NMT with urban planning and decision making processes and budgets.
- Build capacities to enable effective implementation.

The following section outlines the strategies that the D

3.1. Build Leadership Support

The Urban Development and Poverty Alleviation Department (UD&PA) has the authority, vision and resources to envision and plan NMT interventions in the city of Aizawl. The department has a strong role in forming a coordination body for urban transit like an UMTA and supporting coordinated development of urban transport in the city. Aizawl City Governments demonstrate strong interdepartmental coordination (refer Figure 3.1) and support regarding the development of the city.

The Municipal Council was formed recently in 2012. It has a skilled cadre of young engineers, planners and architects to provide technical support for resolving traffic and transport issues in the city. Capacity building on urban transport issues in general and NMT in particular would go a long way in supporting the resolution of transport issues in the city. Training sessions for all departments in the municipality would help in enabling interdepartmental co-operation. The AMC would be a good place to establish a NMT cell and have ongoing support to build its capacity.

The Traffic Police is very effective and organised in the city, especially due the leadership of the Superintendent of Police. They have taken several on-ground initiatives to resolve the traffic situation in the city. Some of the the other priorities expressed by the traffic police included reducing the number of accidents and ensuring safe crossings for pedestrians. Recent initiatives spearheaded by the traffic police include monitoring and enforcing the no-parking zones and penalizing motorists for over speeding and drunk driving.

Figure 3.1: Stakeholder consultation in Aizawl

Source: iTrans

3.2. Identify Project Champions

The success of any project is dependent on the confidence the state or city authorities have in it. Therefore, it is very important to create a city level commitment that endures changes in political leadership or bureaucracy and administration in Aizawl.

The first step is to create high level political commitment to boost NMT modal shares. A very positive start for city of Aizawl is that the city leadership is in full support of cycling and walking. For successful implementation, politicians must be able to clearly express their cycling vision and its benefits.

With encouragement and support from city leadership, the UD&PA department is taking interest in initiatives that support NMT and have had multi stakeholder engagements for the same. Given the raised awareness amongst public and increase in government capacity, initiatives in NMT improvement could continue well beyond the tenure of the minister. The fact that the Police, Aizawl Development Authority, and the newly formed municipality are aligned with the same vision will ensure sustainability of the same.

It is important for UD&PA department to formulate a vision and plan to promote and enhance non-motorised transport in the city. Senior executives such as Principal Secretary, UD, Municipality, Development Authority, Police, TCPO and commissioner etc. in Aizawl should support in making it happen. Moreover, these high visible leaders should be invited to walk and cycle to work on a particular day or two like it is done in other cities so that, it encourages the public to take up NMT modes as main modes of transportation. Leaders should be ready and proud to showcase their walking and cycling culture. It is also essential to build commitment across fields and political parties, so that, the vision of the city remains consistent across political parties and the projects do not get abandoned due to changes in leadership.

Chief Secretary of Mizoram and Superintendent of Police, Aizawl district walk to office every day. They can be identified as local leaders/champions who choose walk as mode to commute daily because of sustainable lifestyle choices rather than captivity.

3.3. Develop Institutional Capacities

To help achieve a more sustained operation programme, continuity of sustainable practices at the institutional level is crucial. Investing in embedding the support for NMT across all agencies involved in city building specifically in Aizawl's context, the following actions are suggested:

- Develop a multi-agency work progam with specific listing of all functions, frequency of tasks, quality standards, and estimated unit costs and/or staffing requirements.
- Prepare annual budgets that anticipate the implementation of NMT improvements in five-year increments. The program must be cost-effective with sustainable funding sources identified.
- Develop a goal-oriented programme based on the written and agreed policies and guidelines.
- Establish a NMT Cell to serve as liaison/advocate for the NMT transportation system. Figure 3.2 illustrates a proposed structure of the NMT Cell under the AMC.
- Appoint a NMT Coordinator with urban transport development and management skills to coordinate with the system and related programs. This "NMT Coordinator" should partner with appropriate departments and/or organizations to carry out various operations, management, and programming functions.

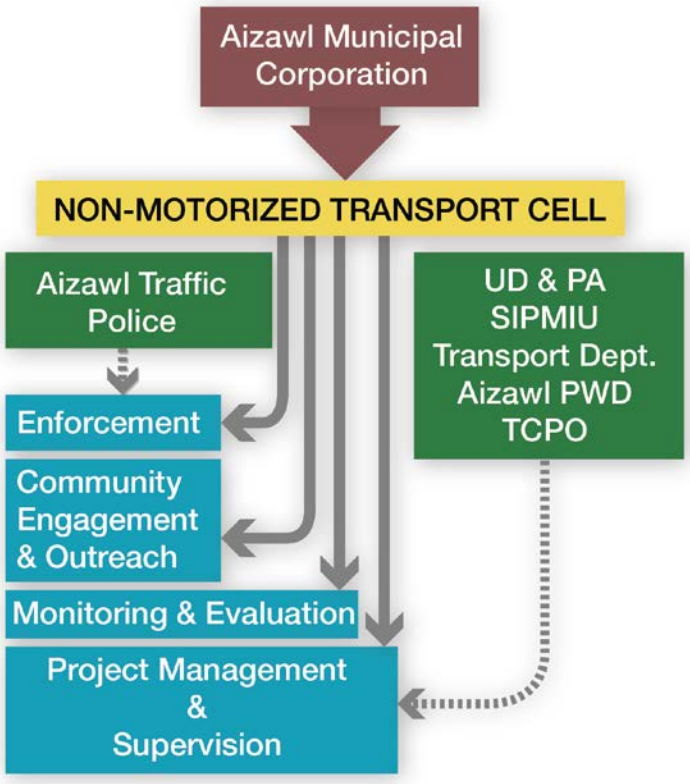


Figure 3.2: Proposed NMT Cell for Aizawl

Source: IBI Group

3.3.1. Augment Technical Capacities

One of the primary obstacles in taking up and implementing initiatives and projects for walking and cycling is the lack of trained transport planners and engineers familiar with NMT planning in city agencies around the country, including Aizawl. The city should consider augmenting their current resources through retaining a dedicated project management consultant (PMC), stationed in Aizawl, with 2-3 mid-level planners that have experience in sustainable transportation and urban development, especially preparation of detailed NMT plans. The PMC should also have a resource pool of experts available on an as-needed basis to the city in the fields of capacity building, community outreach, land use planning, information technology and GIS.

The Plan recommends that the state and city should invest in professional development of its current staff by ensuring regular representation in the capacity building and tranining workshops conducted by the agencies under the Ministry of Urban Development, Government of India such as the Institute for Urban Transport (IUT), Sustainable Urban Transport Project (SUTP), and National Institute of Urban Affairs (NIUA). Further, the state and city should continue working with international development agencies such as ADB, GIZ, DFID and other foundations focussing on promoting clean mobility practices in India. Technical and financial assistance from these international agencies could enable the local government in building the local capacities as well as harnessing funds for detailed studies and implementation projects to demonstrate success.

3.4. Vision and Objectives

With a large number of people walking in Aizawl, the city needs to prioritise the vision for safe and inclusive streets for all citizens. A pedestrian-first planning paradigm shift in Aizawl's constrained conditions will help retain and increase the NMT mode share in the city.

With this understanding, the following NMT specific objectives are proposed for Aizawl City:

i. **Improve the walking experience in the city**
ii. **Establish innovative ways to provide universal accessibility for the hilly city**
iii. **Develop a culture for recreational and commuter bicycling in appropriate areas**
iv. **Reduce accidents and pollution through strategic investments in NMT infrastructure**

3.5. Participatory Planning

Participatory planning is an urban planning paradigm that emphasises involving the entire community in the strategic and management processes of urban planning; or, community-level planning processes. The following strategies will lead to effective participatory planning that could further citizen and city staff awareness in promoting sustainable transportation practices in the city of Aizawl:

- Involvement of all stakeholders such AMC, PWD, TCPO, UD etc. and common citizens from the beginning of the process and until the end, with the acceptance of new stakeholders into the process who might emerge during the process.
- Incorporation of diverse views and opinions of individuals within stakeholder groups.
- Provision of information, in the form that is appropriate for all participants in understanding the issues being addressed, so that the decisions are made accordingly.
- Recognition and accommodation for the inequities among stakeholder groups and among individuals, in order to assure that those that are more powerful do not dominate or manipulate processes.

Figure 3.3: Participatory planning in Aizawl during NMT workshop
Source: iTrans

CHAPTER IV: PLAN + DESIGN

4. PLAN + DESIGN

The NMT Plan for Aizawl City is prepared at two scales: **Network Plan and Site Specific Interventions**. A Network Plan is proposed at the city wide scale. The objective of the NMT Network Plan is to ensure a dependable, safe and comfortable experience for pedestrians and any potential cyclists throughout the city. A compendium of site-specific NMT interventions is proposed at a smaller scale within the city core in the next section. The NMT Network Plan and Site Specific Design Interventions are developed based on the NMT guiding principles and supporting principles provided in MoUD's National-level Guidance Document for NMT Plans (2016) as presented in Figure 4.1 and Tables 4.1 and 4.2.

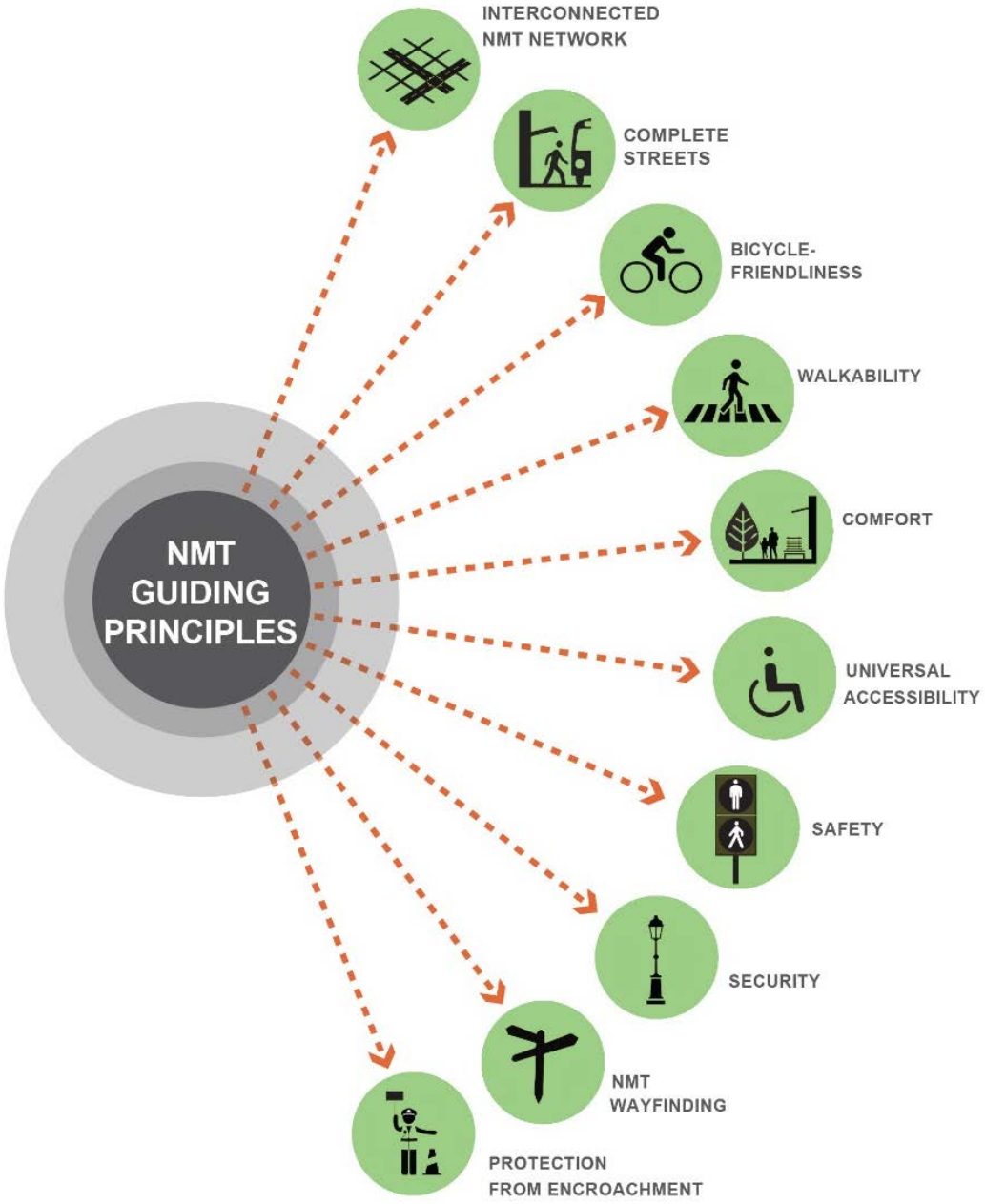


Figure 4.1: NMT Guiding Principles

Source: NMT Guidance Document, MoUD, 2016 prepared by IBI Group

Table 4.1 NMT Guiding Principles

1. Interconnected NMT Network

An interconnected NMT network reduces congestion, encourages use of NMT modes and reduces walking distances between places as well as travel times.

2. Complete Streets

Complete Streets are streets for everyone. They are designed and operated to enable safe access for all users, including pedestrians, bicyclists, motorists and transit riders of all ages and abilities.

3. Bicycle – Friendliness

Bicycles are efficient ways to expand accessibility without relying on automobiles or bus service. Bicycle lanes, bicycle routes, and secure bicycle parking make the bicycle an easy option.

4. Walkability

A qualitative measure of the cities that inspires walking trips. Often used in conjunction with liveability, walkability is a defined more by the quality of the place than by any transport-related metric.

4. Comfort

An attractive streetscape and public realm with design elements, coordinated to provide shade, weather protection, pedestrian amenities and visual interest improves the desirability of walking and shortens the perception of distance.

6. Universal Accessibility

Universal Accessibility simplifies navigation and reduces physical effort to an extent that a physically handicapped person should be able to navigate the pedestrian facilities without external assistance. It is a design approach that is meant to improve the usability and appeal of places by all types of users.

7. Safety

Developing the pedestrian environment to maximise safety will reduce the risk of accidents and enhance pedestrian experience in urban areas.

8. Security

Ensuring security of vulnerable groups such as women and children in the public realm will increase attractiveness of NMT. Crime Prevention through Environmental Design (CPTED) is an approach intended to discourage criminal behaviour through urban design principles.

9. NMT Wayfinding

Wayfinding is an essential feature to assist the users in navigation and improve sense of place. Develop wayfinding and signage, with focus on NMT users, to support the legibility and permeability of the cities.

10. Protection from Encroachment

Protection from encroachment ensures continuity and predictability in NMT use. It allows uninterrupted non-motorised mobility and brings in a sense of order.

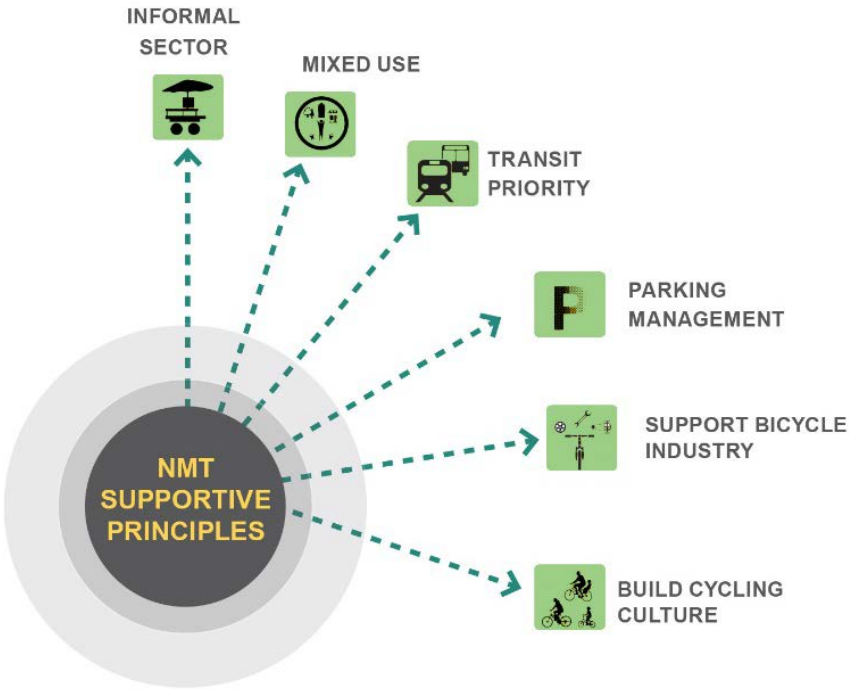


Figure 4.2: NMT Supportive Principles

Source: NMT Guidance Document, MoUD, prepared by IBI Group

Table 4.2 NMT Supportive Principles

1. Informal Sector

To achieve the goal of inclusive mobility, integrate the informal sector such as street vendors and settlements in planning and design of NMT infrastructure within the cities.

2. Mixed Use

A mix of diverse and complimentary land uses in a compact pattern allows residents and workers to walk to work or to shop rather than driving for all daily needs.

3. Transit Priority

Transit priority planning encourages non-motorised modes for first and last mile connectivity promoting a shift towards increased NMT usage.

4. Parking Management

Utilise parking management strategies as a travel demand management tool to discourage personal vehicle usage, reduce parking demand, and promote sustainable mobility opportunities to build people-oriented neighbourhoods.

5. Support Bicycle Industry

To reverse the declining trends in the bicycle industry, initiate key tax incentives and investment in research and development.

6. Build Cycling Culture

Promote healthy lifestyle and sustainable living principles by encouraging recreational cycling and conducting events like Raahgiri and Cyclothons. This will help elevate the perception of cycling, and promote a cycling culture in cities.

Table 4.3 NMT proposals and applied planning principles

NMT Network Improvement

1. Proposed Street Hierarchy

2. Retrofitting the Streets

3. Redesign Intersection Geometries

4. Public Stairs

5. NMT Predominant Streets

6. Enhancing Safety Security

7. Information to Road Users

Site-specific NMT Proposals (for Core City Area)

1. Pedestrian Streets

2. Street Retrofits

3. Intersection Improvements

4. Public Stair Improvements

5. Multi-level Car Park

6. Signature Project: Pedestrianization of 1.5km stretch between Chanmari to Dawrpui

7. Pilot Project: Public Stairs along main commercial stretch

Long-Term Interventions

1. Alternative Mobility Options

2. Cycling Network

Souce: iTrans

4.1. The Principles of Network Planning

A NMT Network Plan must ensure that the NMT improvements taken up at the street, corridor or area level lead to an overall improvement in the NMT attractiveness of the city. An ideal NMT network design has five main requirements – **Coherence, Directness, Attractiveness, Safety and Comfort**. These objectives can be met only when pedestrians and cyclists have access to a network of usable links that can take them from origin to destination with maximum comfort and minimum barriers.

Based on the issues identified in the baseline assessment, the following components of an NMT network have been identified for Aizawl:

1. ***Pedestrian footpaths***: Walking is the most popular mode in Aizawl. Providing basic and continuous walking footpaths with no interruptions and barriers is the most urgent need for the city. A minimum width of 1.8m for footpaths should be provided based on the Design of Urban Roads, Code of Practice, 2012.
2. ***Pedestrian-only streets***: The enormous volume of pedestrian traffic in the city core necessitates consideration of a few streets being blocked-off completely to traffic and used only by pedestrians or cyclists.
3. ***Public stairs***: Public stairs offer the most direct connections to pedestrians, reducing trip times by walk mode substantially.
4. ***Intersections***: Pedestrians must be given priority at all intersections and mid-block crossings to improve safety through provision of pedestrian accentuated signals. In general, traffic speeds are low in Aizawl because of the hilly terrain. However, traffic calming must be considered at intersections with low volumes to ensure pedestrian safety at all times.

Aizawl has a high number of street activities mainly including street hawkers. All design interventions must ensure that these informal street users are integrated in the design process in a manner that enhances the walking experience instead of being perceived as encroachments on footpaths.

Because cycling is not a popular mode of travel in Aizawl due to the terrain, it has not been included as a core component of the NMT network. However, recreational routes will also be identified as a part of the network planning exercise for long-term implementation.

4.2. Integrated NMT and Land Use Planning

Land use and transportation are interconnected with NMT modes preferred in compact, dense settlements. Mixed land uses, as are prevalent in Aizawl, promote higher number of activities within walking distance, and consequentially discourage motor vehicle trips. The city's land use plan must ensure that work, commercial markets, hospitals, schools and residential areas are closely located and promote more walking and potential cycling. Land uses such as schools, industries, commercial areas, tourists and recreational points attract the most NMT-captive population and thus should be linked with large, dense, safe and accessible NMT facilities. Figure 4.4 identifies social, institutional and recreational zones in the cities, earmarking them for priority interventions for pedestrians.

Building bye-laws and planning norms should also encourage investment in pedestrian facilities such as pedestrian-oriented spaces, active and public frontage zones, etc. Micro-planning instruments such as local area plans may be introduced to ensure that neighbourhoods have a pedestrian-friendly public realm. Placemaking, one the most popular movements in current times, focuses on improving the experience of pedestrians in the public realm, and consequentially improving the quality of life in the city. The city should consider implementing quick-win pilot projects that enhance the quality of public space, as well as improving the overall pedestrian experience.

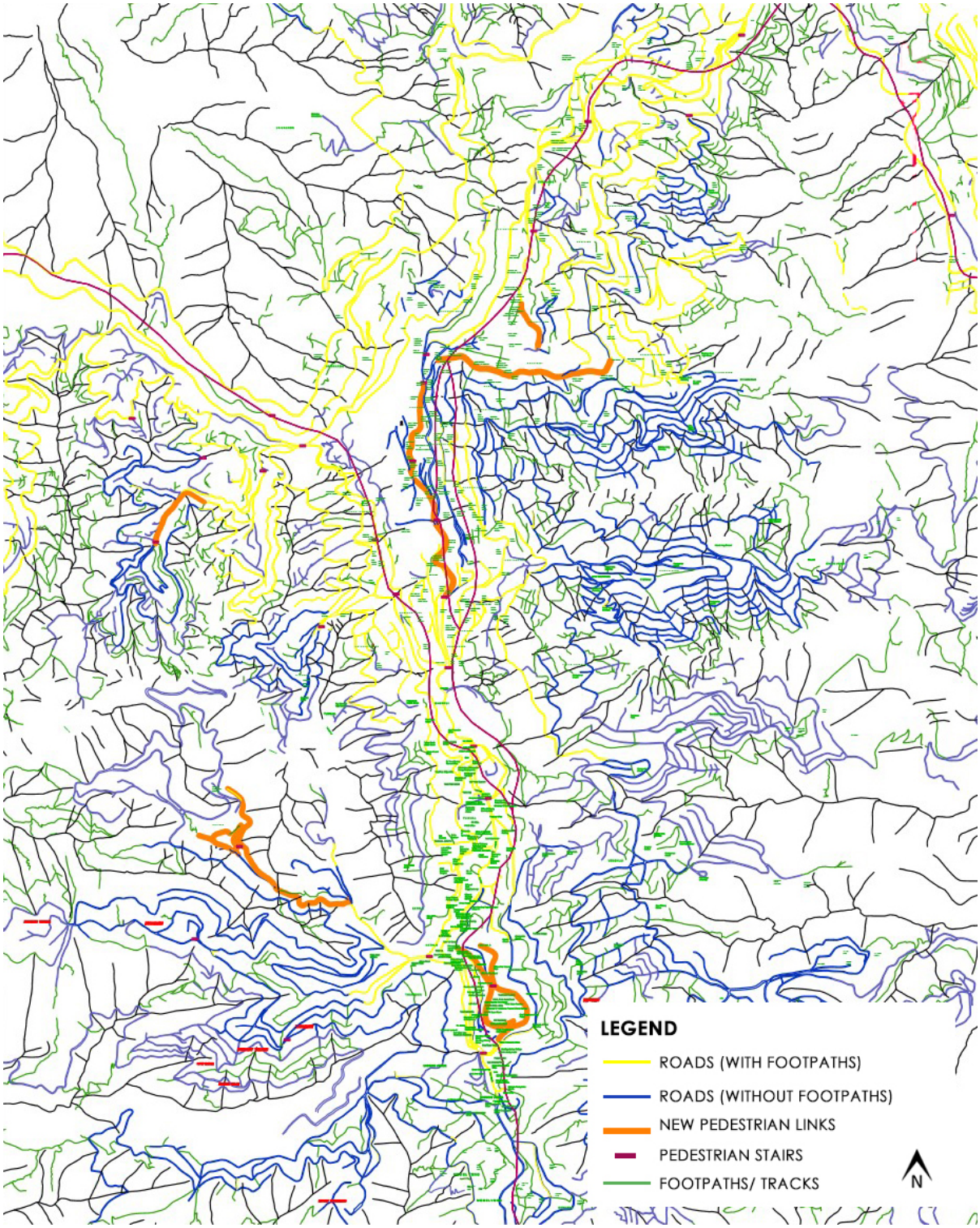


Figure 4.3: Pedestrian network proposed by CTTP 2011

Source: Comprehensive Traffic and Transportation Plan (CTTP) for the City of Aizawl, 2011

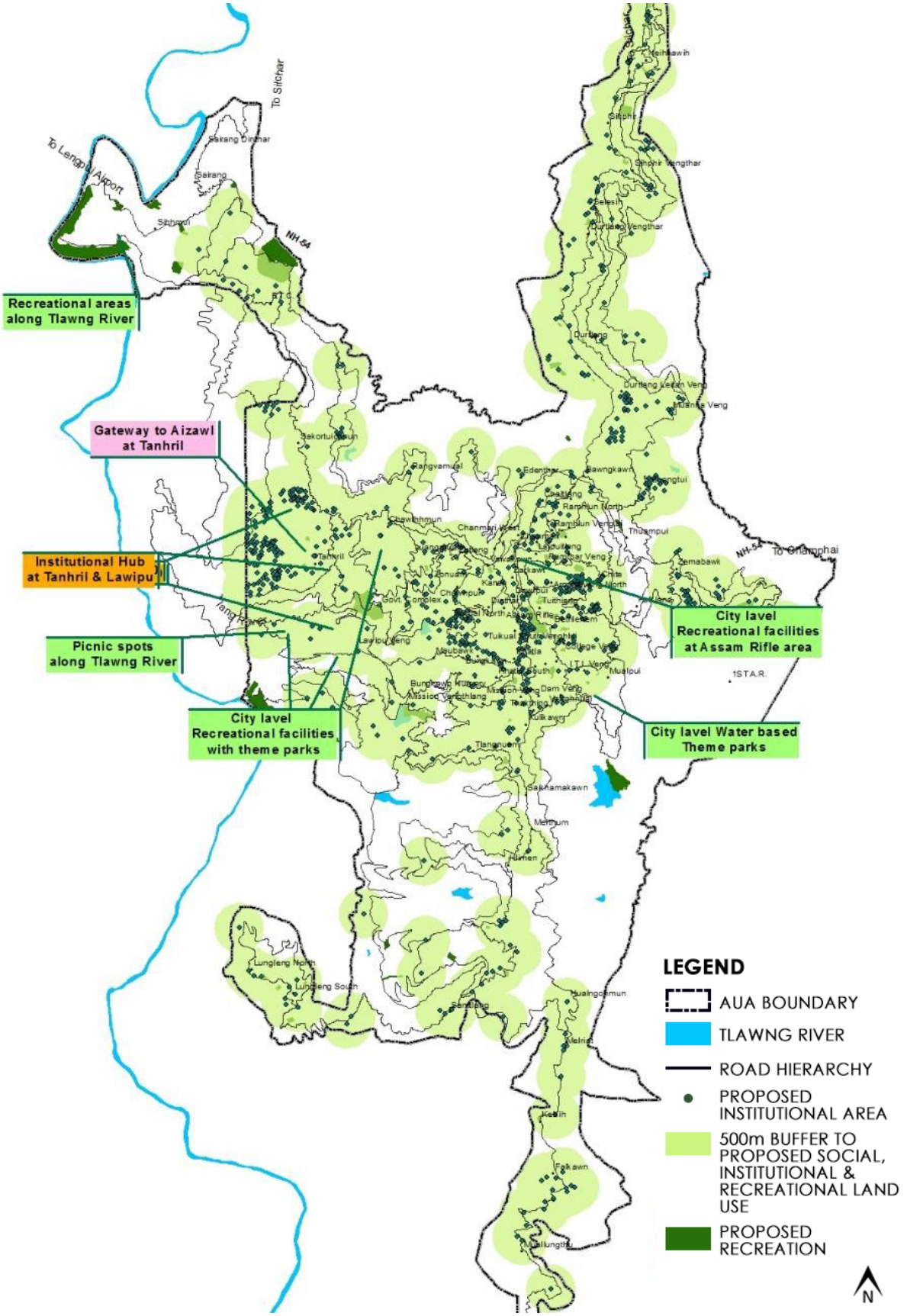


Figure 4.4: NMT facility improvement zones with 500m buffer around social, institutional, and recreational establishments

Source: iTrans

4.3. Proposed NMT Network

The Aizawl CTTP 2011 proposed a pedestrian network that identifies new pedestrian links, footpaths, and pedestrian stairs. As part of the Aizawl NMT Plan, this network was validated on ground and key details developed. Table 4.4 shows the links grouped in the following categories:

Table 4.4 Proposed NMT improvements as proposed in CTTP 2011

Link Category	Type on Intervention
1. Roads with footpaths	Maintain and Upgrade
2. Roads without footpaths	Maintain and Upgrade
3. Only footpaths/pedestrian tracks	Retrofitting
4. Pedestrian stairs	Maintain and Upgrade
5. New links for pedestrian connectivity	New infrastructure

Source: CTTP 2011

4.3.1. Proposed Street Hierarchy in Aizawl

This Plan proposes a NMT-friendly street hierarchy that would be applicable to the NMT network proposed by the CTTP. Three types of road widths are identified as part of the street hierarchy (refer Figure 4.5) –

- Type I – includes roads with a ROW of 10m and more. Many of these roads are used for goods transport and see truck movements
- Type II – includes roads with a ROW of 8-10m. These roads are mainly in the populated areas
- Type III – includes roads with a ROW of 6-8m

Further these roads are categorised based on volumes of vehicular movement. Because of topographical constraints, many roads in the city serve as both passenger and freight transport corridors. The needs for freight transport must be considered along with the need for efficient NMT movement. Accordingly three kinds of vehicular volumes are considered while detailing the proposed street hierarchy for the city. These are:

- Heavy Volumes – This includes movement of trucks, passenger buses and light motor vehicles. Many roads that provide regional connectivity fall under this category.
- Moderate Volumes – This includes movement of passenger buses and light motor vehicles Roads providing intra-city connections fall under this category.
- Light Volumes – This includes roads with only light motor vehicle movement. Internal roads in remote locations or residential areas fall in this category.

The proposed ROW usage has thus been defined based on road widths and vehicular volumes, as shown in the Table 4.5. Minimum clear footpath widths have also been provided. Footpaths should ideally be located on one or both sides that have continuous building frontage, such as the Bazar area in Aizawl. Streets with adequate right-of-way widths should be designed for equitable allocation of road space for all modes, and not just cars. Streets with a significant vendor presence should be provided with 3m footpaths to allow for 1m encroachment by street vendors, where feasible.

Painted cycle lanes are proposed on wide streets with low vehicular volumes. These will serve to remind drivers to give priority to cyclists, when needed. No segregations are proposed for roads narrower than 6m. However, it is recommended that such roads should have textured paving such as cobblestones etc. (not bituminous road). This will promote pedestrian priority by ensuring slow speeds for pedestrian safety.

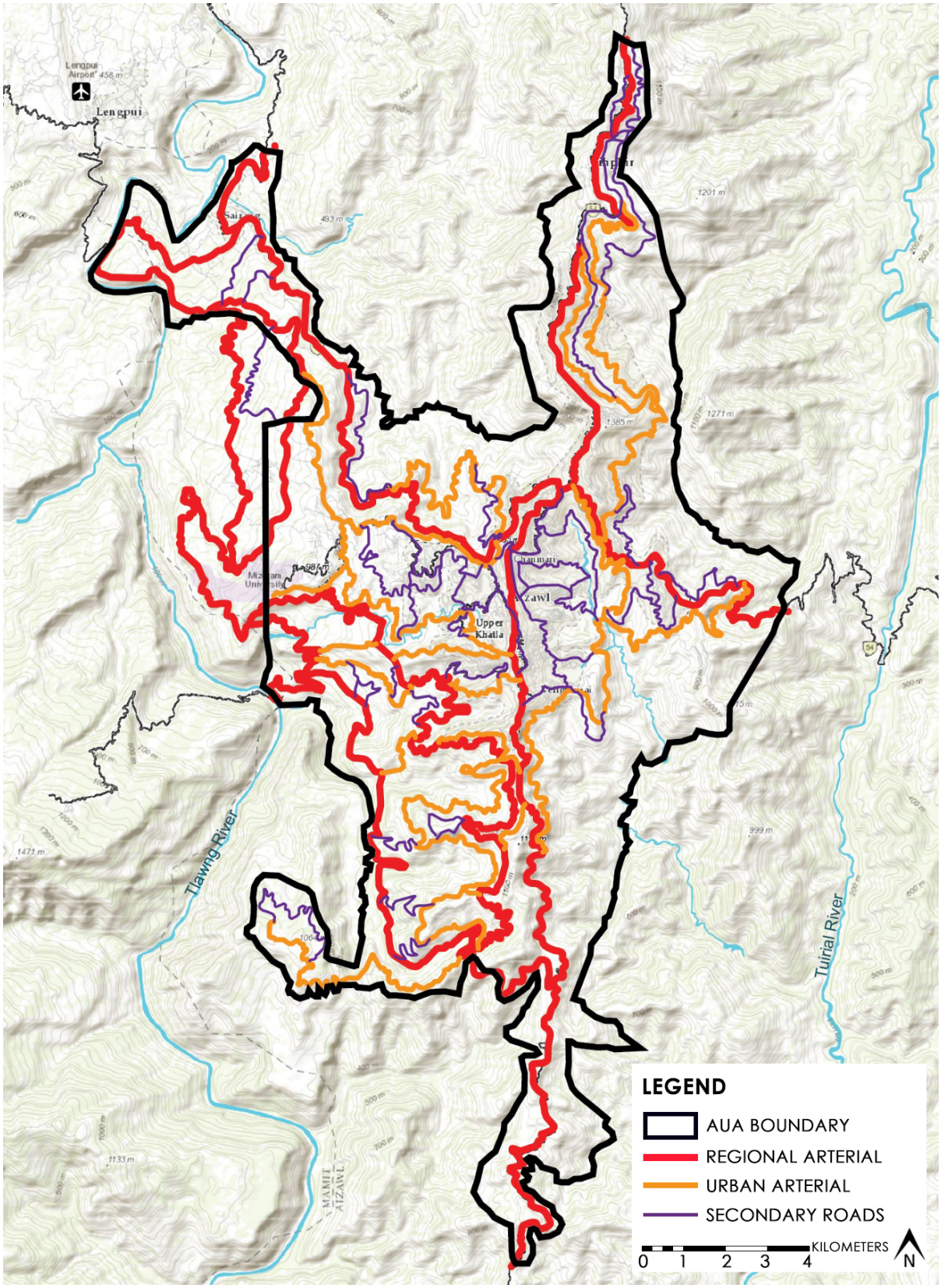


Figure 4.5: Existing street hierarchy in Aizawl

Source: iTrans

Table 4.5: Proposed street hierarchy and ROW usage

Street ROW	Vehicular Volumes	Travel Lanes	Min. Clear Footpath	Cycle Lane (Long-Term)	On-Street Parking/ Vending
10m or more	Heavy	3.5m	2m (both sides) OR 3m (one side)	-	No
	Moderate	3.5m	2m (both sides) OR 3m (one side)	-	Yes (depending on space availability)
	Low	3m	1.5m (both sides) OR 2m (one side)	1.5m (both sides)	Yes
8-10 m	Heavy	3.5m	1.5m (both sides) OR 2m (one side)	-	No
	Moderate	3m	2m (both sides) OR 3m (one side)	-	Yes (depending on space availability)
	Low	3m	1.5m (both sides) OR 2m (one side)	1-1.5m (one or both sides)	Yes
6-8 m	Moderate	3m	1.5m (both sides) OR 2m (one side)	-	No
	Low	3m	1.5m (one side)	-	Yes
6m or less	Pedestrian Only / Shared Street				

Source: IBI Group

Using the ROW usage dimensions shown above, street cross sections for specific conditions are illustrated below (Figure 4.7 - Figure 4.11). Some typical streetscaping elements that are proposed include:

- Wall-mounted street lamps – Because most buildings front the streets directly and on account of narrow ROWs, it is proposed to install light fixtures on building facades. This would provide street lighting while allowing uninterrupted space for pedestrians below. (Refer Figure 4.6)
- Kerb heights at 0.10 to 0.15m– Pedestrian footpaths are elevated by minimum 10cm and maximum 15cm.

Figure 4.6: Examples of wall-mounted street lamps

Source: www.dreamstime.com; http://www.osbornsmodels.com/

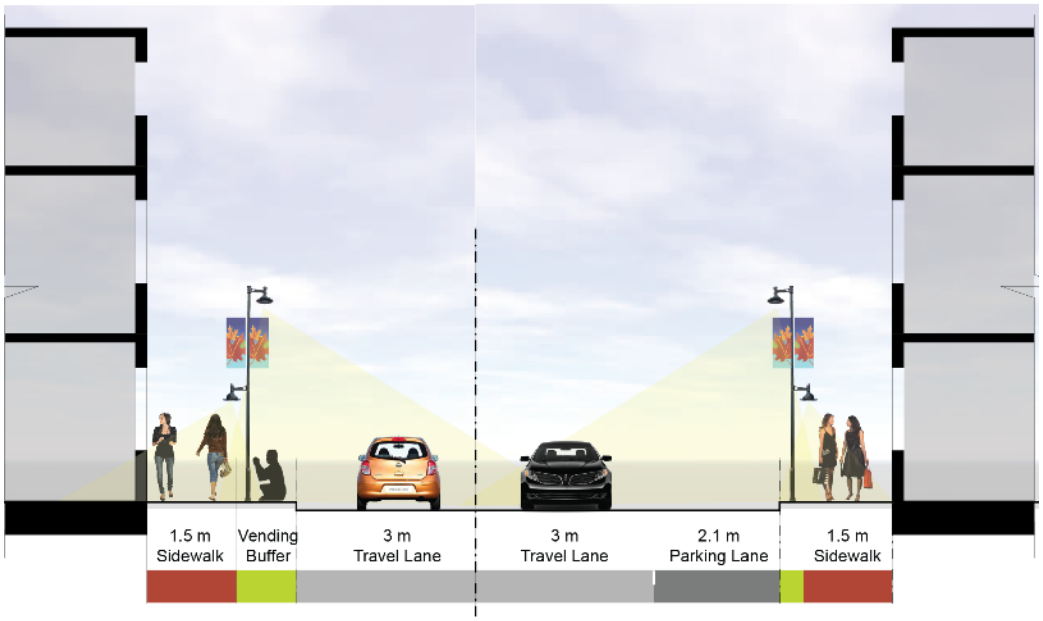


Figure 4.7: Proposed cross section of 12M ROW low volume road showing alternatives to incorporate vendor space or parking space.

Source: IBI Group

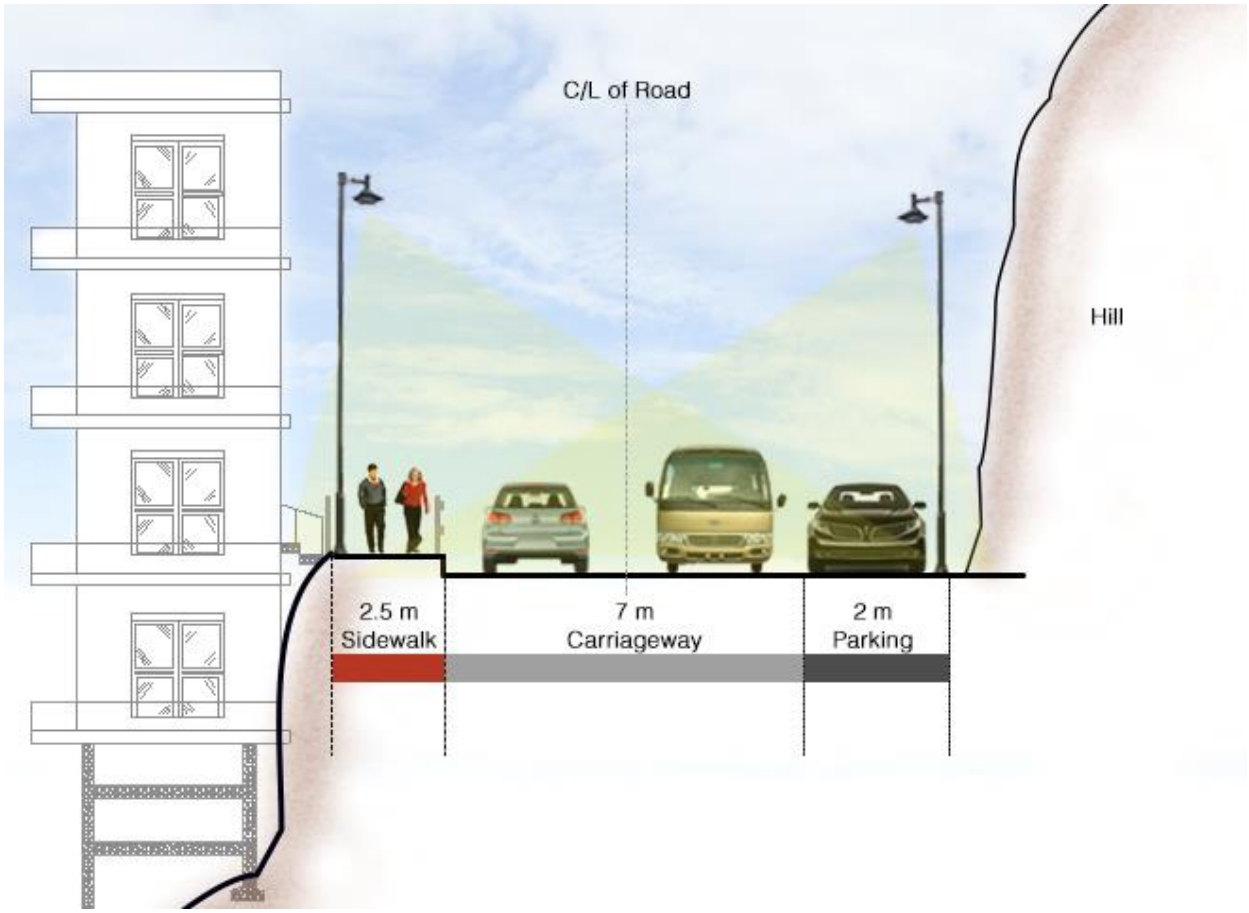


Figure 4.8: Proposed cross section of moderate volume 12M road and one footpath

Source: Adapted from CTTP

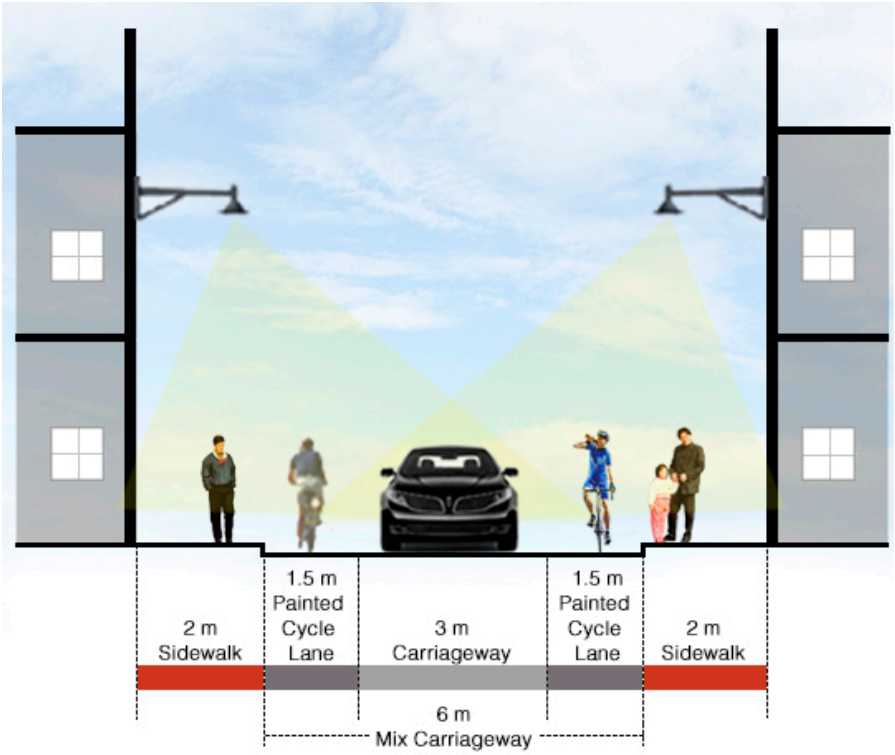


Figure 4.9: Proposed cross section of low volume road with 10 M RoW (with proposed cycle lanes for long-term implementation)

Source: iTrans

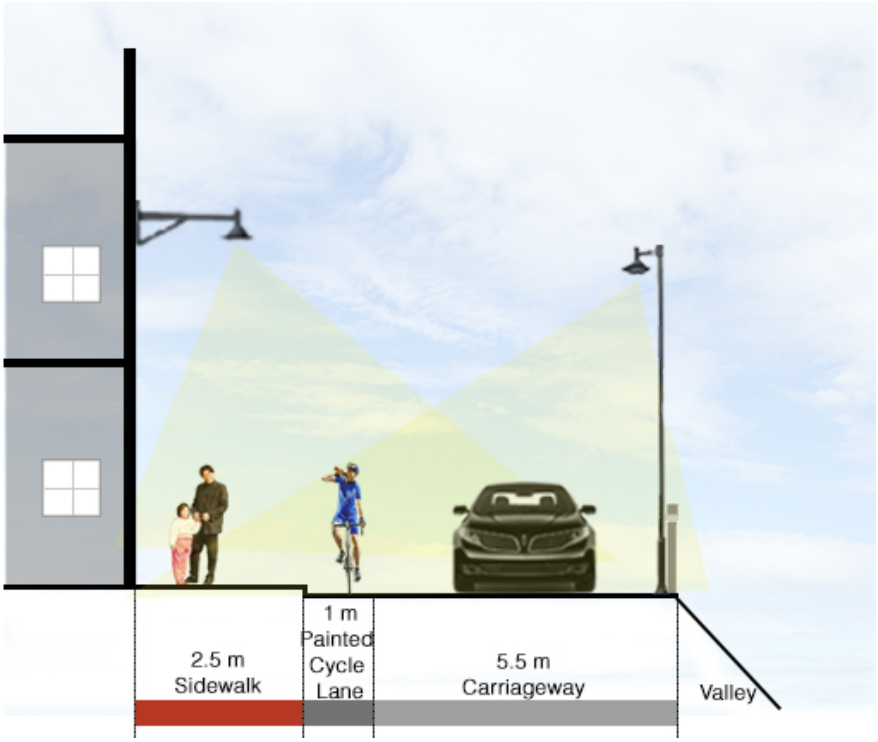


Figure 4.10: Proposed cross section of low volume road with 9 M RoW and valley on one side (with proposed cycle lanes for long-term implementation)

Source: iTrans

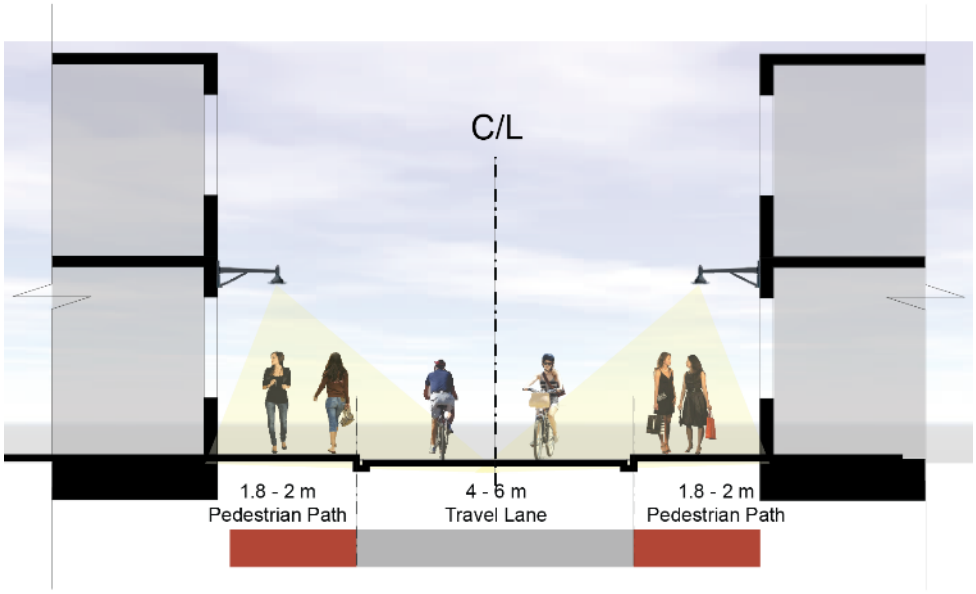


Figure 56 Proposed cross section of moderate volume road with 8M RoW

Source: iTrans

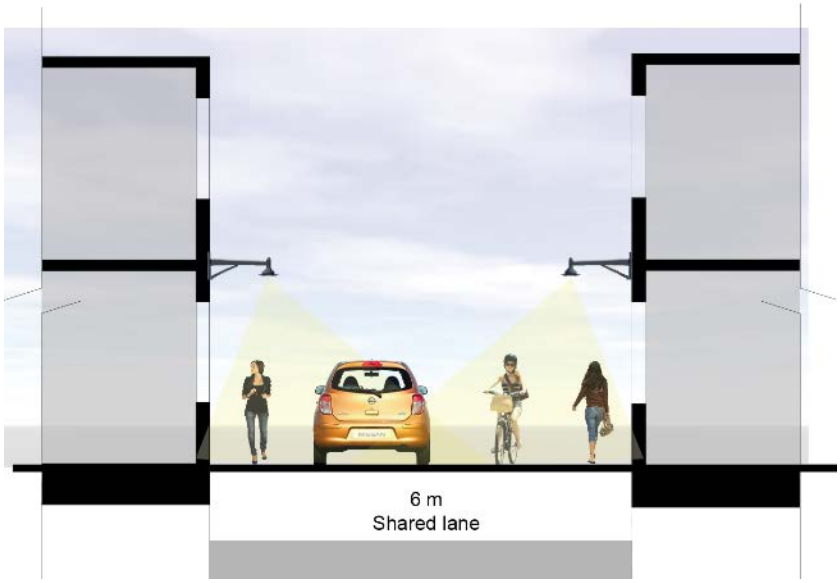


Figure 4.11: Proposed cross section of street with 6 M RoW

Source: iTrans

4.3.2. Retrofitting the Streets

Retrofitting streets for better NMT facilities is not only about finding spaces for footpaths, but also about making space for street lighting or rainwater drains. It is important to realign utility lines like water supply, electricity, telephone, gas etc., to ensure that their maintenance needs will not disturb the pedestrian mobility. Also, it is critical to remove and relocate illegal structures and vending zones when they obstruct seamless pedestrian mobility. Retrofitting streets and connection of public stairs will be required for making a complete network for pedestrians.

4.3.3. Redesigning Intersection Geometries

Intersections are one of the most critical element of a complete NMT network. They form a substantial barrier, both physical and perceived, to NMT movement. Therefore, intersection improvements must not only aim to physically address safety issues but also address perception-of-danger issues. Footover bridges have been proposed at several locations in the CTTP 2011. However this plan does not recognise footover bridges as a viable solution to NMT issues at intersections. It is recommended that footover bridges be provided sparingly, only in the following cases are true:

- If a footover bridge will reduce pedestrian effort. For example, in a situation where there is grade difference between two crossing roads, a footover bridge may help reduce human effort while crossing.
- If either one or both intersection roads are high speed and high volume and the location is remote (i.e. not a built up part of the city)

Besides footover bridges, the following design interventions must be considered while redesigning intersections:

- **Optimal Turning Radius –** Turning radii must be reduced to the minimum required to allow vehicles to turn at 15kmph or less, while allowing for sight distance availability at all times.
- **Signalization –** Intersections with high volumes including heavy vehicles, must be signalised with minimum 10 second pedestrian green time. Signalization adds reliability and comfort to the walking experience.
- **Raised Intersections –** Intersections that are raised to kerb level so as to allow seamless movement for pedestrians and slow down vehicles are known as raised intersection. This is one the most preferred traffic calming method. They not only slow vehicles down, but also improve the perception of pedestrian priority. (Refer Figure 4.12)
- **Placemaking Interventions –** Intersections that are treated with different materials such as cobble stones, or are painted with street murals, are slowly becoming a popular method to establish pedestrian priority. (Refer 4.13)

Table 4.6: Preferred design interventions based on intersection characteristics

Intersection Type	Turning Volumes	Min. Turning Radius	Signalization	Raised Intersection	Placemaking
Streets 10m or more	Heavy (including Trucks and buses)	7.5m	Required	No	No
	Low	3.0m	Preferred	Yes	Yes
Streets less than 10m	Heavy	6.0m	Preferred	Yes	No
	Low	3.0m	Not Required	Yes	Yes

Figure 4.12: A raised intersection

Source: NACTO.org

Community residents celebrate the completion of the mural | Image by City Repair Project

Figure 4.13: A mural adorned intersection in Portland OR

Source: http://www.buffalorising.com/2016/02/wonderful-examples-of-place-making-highlighted-by-pps/

The intersections identified by the CTTP 2011 for improvement are shown below. These can be improved based on the recommended geometry in Table 4.7.

Table 4.7: List of intersections and suggested improvements from CTTP 2011

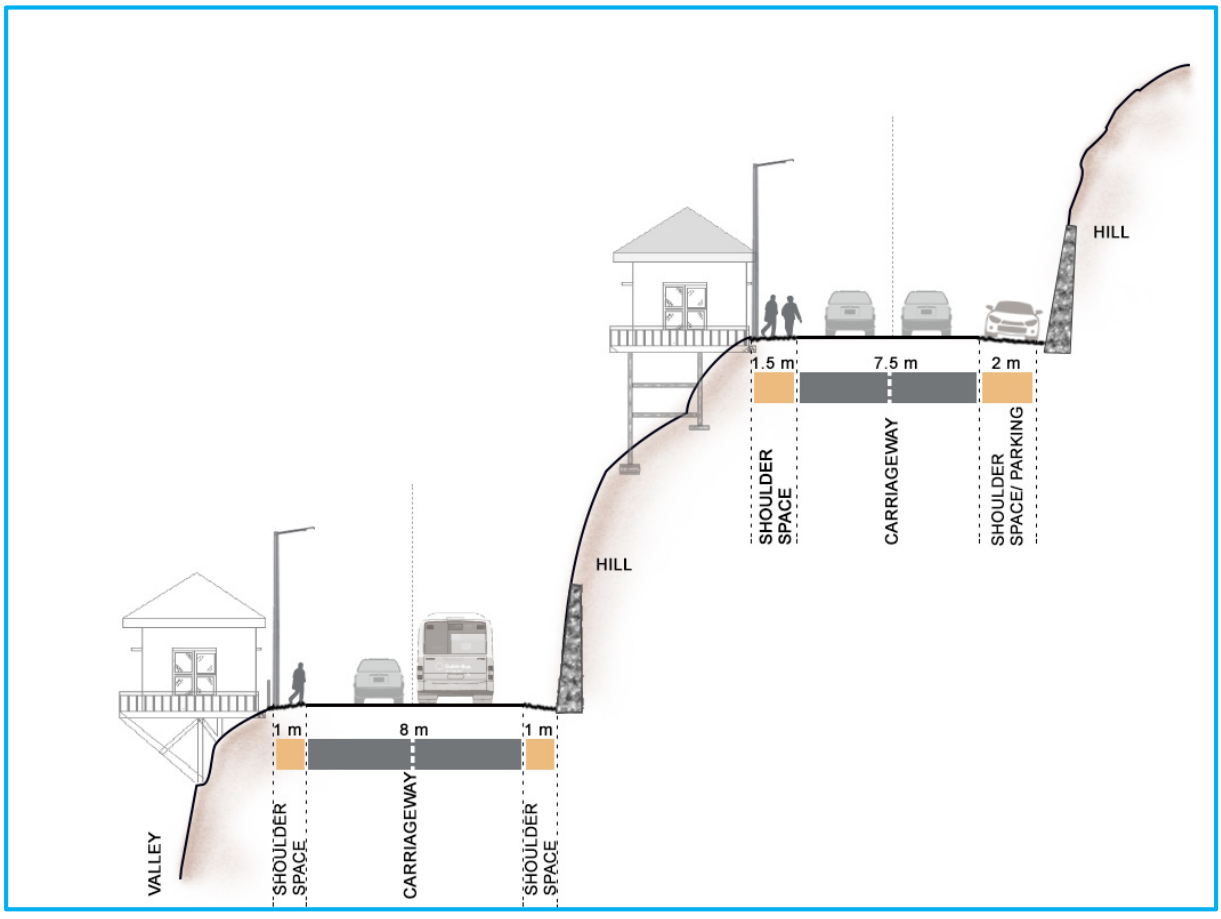
Sl. No	Intersection Name	Intersection Type	Suggested Improvements
1	Vaivakawn Jn.	3-arm	Standard carriageway width, turning radius, foot path, road marking
2	Khatla Jn.	3-arm	Standard carriageway width, turning radius, foot path, road marking
3	Sikulpuikawn Jn.	6-arm	Standard carriageway width, turning radius, foot path, road marking, island
4	RajBhawan Jn.	3-arm	Turning radius, foot path, road marking, island
5	TempleSq Jn.	4-arm	Standard carriageway width, turning radius, foot path, road marking, island
6	ZodinSq Jn.	4-arm	Standard carriageway width, turning radius, foot path, road marking
7	Kulikawn Jn.	4-arm	Standard carriageway width, turning radius, foot path, road marking
8	Bawngkawn North Jn.	3-arm	Standard carriageway width, turning radius, foot path, road marking
9	Bawngkawn South Jn.	4-arm	Standard carriageway width, turning radius, foot path, road marking
10	Zarkawt Jn.	4-arm	Standard carriageway width, turning radius, foot path, road marking
11	Bungkawn Jn.	5-arm	Standard carriageway width, turning radius, foot path, road marking
12	Chanmari Jn.	4-arm	Standard carriageway width, turning radius, foot path, road marking

Source: CTTP, 2011

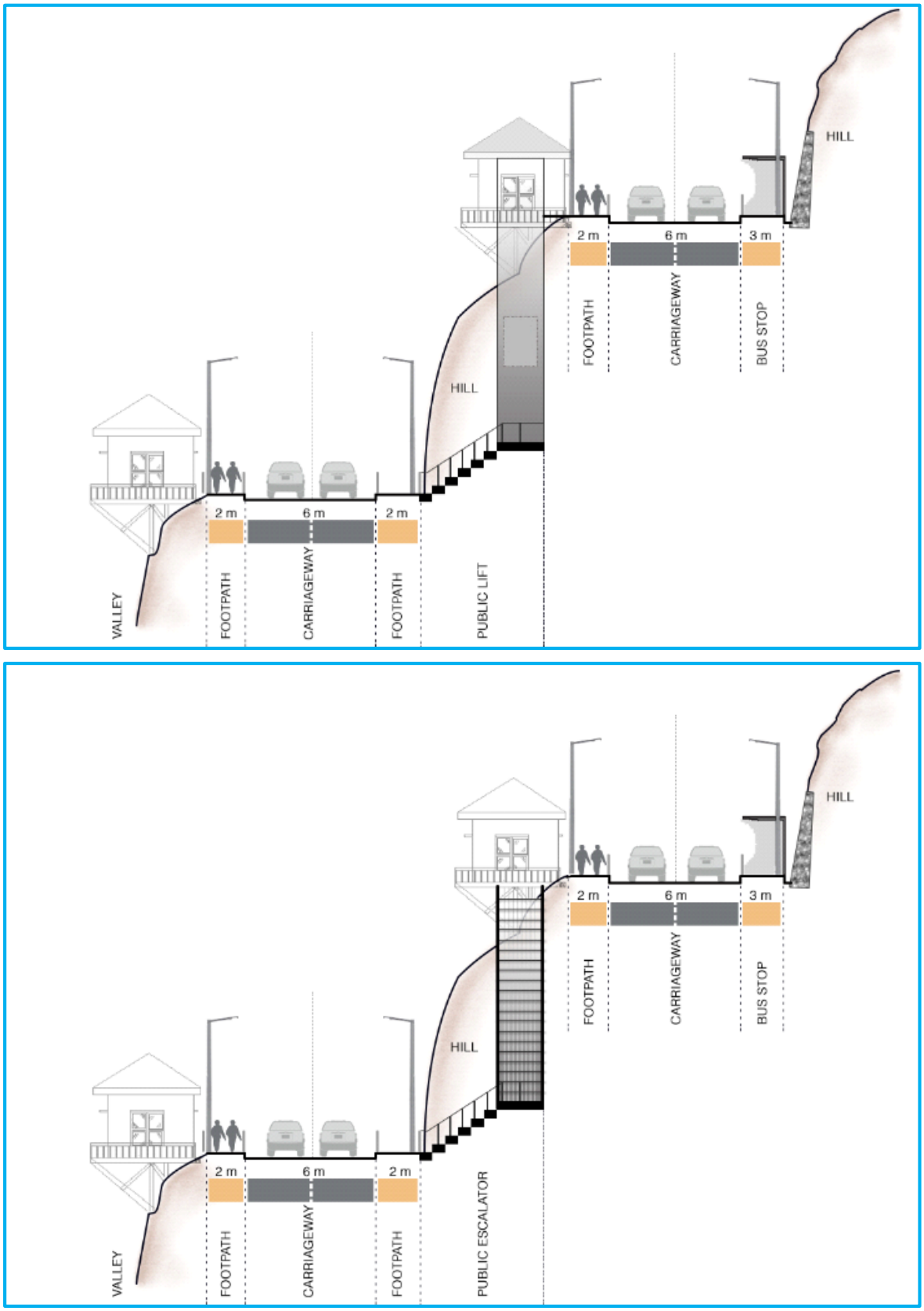
4.3.4. Public Stairs

There are numerous public stairs in Aizawl connecting important places and providing crucial pedestrian links, allowing shortening of pedestrian trip lengths. Staircases must be connected to the footpath network to facilitate direct and safe pedestrian movement throughout the hill city

Integrate design principles that assure barrier-free movement for all types of NMT users including children, physically or cognitively impaired pedestrians, wheelchair and luggage carts, in addition to pedestrians, cyclists and other non-motorised vehicles. An alternative approach to incorporate mechanised means of connectivity, including escalators and lifts are proposed for the public stairs network. Stairways that have higher footfall or connect to commercial areas in the city, could be upgraded with escalators or lifts for quick and comfortable mobility. Areas requiring universal mobility options, close to hospitals etc, should be prioritized with lifts.



EXISITNG SECTION



PROPOSED SECTIONS (ALTERNATIVES)

Figure 4.14: Existing and Proposed alternatives for public stairs - lift (top); escalator (bottom)

Source: Adapted from the CTTP, 2011

Several new public stair locations have been identified by the CTTP 2011, based on the travel desire lines throughout the urban area. The NMT Plan recommends upgrading few recommended stair facilities to escalators and lifts based on their proximity to commercial areas. The installation of escalators and lifts will need to be studied through a detailed project report and will potentially require land acquisition.

Table 4.8: Major Locations for provision / improvement of public stairs

S No	Location	CTTP Remark	NMT Plan Recommendation
1	Zodin Sq	Improvement / provision of new stairs	Upgrade to escalator/lift
2	Bazaar Bungkawn	Improvement of existing stairs	Upgrade to escalator/lift
3	Kulikawn	Improvement / provision of new stairs	
4	Thakthing	Improvement / provision of new stairs	
5	Khatla	Improvement of existing stairs	
6	Thuampui	Improvement / provision of new stairs	
7	Chanmari South	Improvement / provision of new stairs	Upgrade to escalator/lift
8	Power House / Lower Bazaar	Improvement of existing stairs	Upgrade to escalator/lift
9	Israel Point	Improvement of existing stairs	
10	Temple Sq	Improvement of existing stairs	Upgrade to escalator/lift
11	Zonet	Improvement / provision of new stairs	
12	Vaivakawn	Improvement / provision of new stairs	
13	Tennis Court	Provision of new stairs	
14	Zarkawt Church	Provision of new stairs	Upgrade to escalator/lift
15	Sikulpuikawn	Improvement / provision of new stairs	
16	Chanmari Chaltlang Road	Improvement / provision of new stairs	Upgrade to escalator/lift
17	Bara Bazaar	Improvement of existing stairs	Upgrade to escalator/lift
18	Chaltlang	Improvement / provision of new stairs	
19	Zion Street	Improvement / provision of new stairs	Upgrade to escalator/lift
20	Civil Hospital	Improvement / provision of new stairs	Upgrade to escalator/lift
21	Ramthar Road	Provision of new stairs	
22	Chanmari North	Provision of new stairs	Upgrade to escalator/lift
23	Bawngkawn	Improvement of existing stairs	
24	Capital Complex	Provision of new stairs	Upgrade to escalator/lift

Source: Adapted from CTTP 2011

Some basic design specifications that need to be enforced for the construction or improvement of public stairs to make them safe and attractive are provided here:

- Stairway must have neither more than 18 nor less than 2 steps in any flight of stairs. There needs to be a landing after 18 steps.
- As far as possible, the riser height should not be more than 150mm.
- All the risers in a flight of steps should have the same height to avoid misjudgement and injury to the users.
- Edge of each tread must have a non-slip finish or an adequate non-skid strip near the edge of the nosing's in a contrasting colour.
- Any landing provided in a stairway must be not less than 750mm long and should have a non-slip finish throughout or an adequate non-skid strip near the edge of the landing where it leads to a flight below.
- Stairway less than 2m in width must be provided with at least one handrail down one side. Where the stairway width is greater than 2m a handrail must be provided on both sides.
- Handrails must be at a height of not less than 865 mm measured above the nosing of stair treads and the floor surface of the ramp, landing.
- Handrails must be continuous between stair flight landings and should have no obstruction on or above them that will tend to break a hand-hold.
- For public stairs that have vendor spaces the along-sides, a clear and effective pedestrian pathway width of at least 1.5m should be maintained for two way movement; clear of vendors and customers who flock around them.
- Vending zones should be avoided on stairs with less than 2m width.

Other improvements that improve the aesthetic appearance of the stairs must also be planned as placemaking initiatives (refer Figure 4.15).

Figure 4.15: Example of public stairs covered in mosaic artwork in San Francisco, California

Source: http://www.yelp.com/biz/the-16th-avenue-tiled-steps-project-san-francisco

CASE STUDY: Escalator in Hong Kong

Hong Kong's, Victoria Peak escalators are the longest escalator system in the world. They begin just above the central business district and cover 800m (135 mts in elevation). They carry 43,000 people per day from residential areas to the central business district for work and errands. After its completion in 1993, the streets directly surrounding the escalator have changed dramatically with an increase in foot traffic and additional commercial space. The neighborhood is now home to trendy bars, cafés, galleries, shops and expensive housing. With the success of the elevator, many more have been proposed throughout the city.

Although Aizawl is a much smaller city as compared to Hong Kong, it too could benefit from escalators serving stretches of commercial areas.

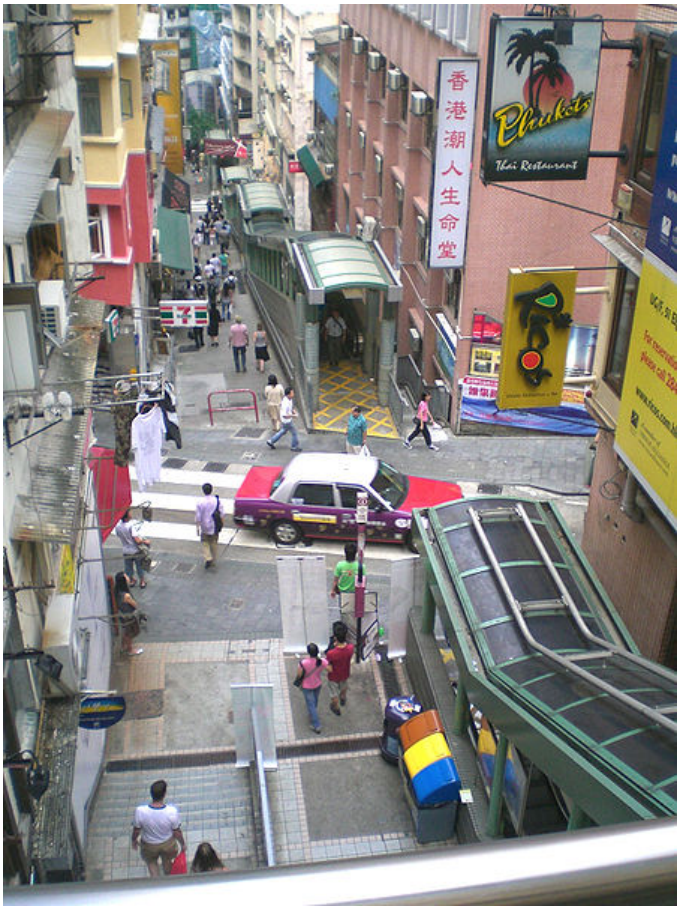


Figure 4.16: Example of public elevator in Hong Kong

Source: http://thisbigcity.net/up-down-hong-kong-worlds-longest-covered-escalator/

4.3.5. NMT Predominant Streets

The final component of the NMT Network Plan is NMT priority streets. These streets would be prioritised for NMT, either through vehicle restrictions, or through design, use of materials and warning signage. All roads with ROW below 6m need to function as predominantly NMT roads with traffic calming measures incorporated in their designs. It is important to ensure that the design speeds are less than 15 kmph along these constrained roads (refer Figure 4.17).

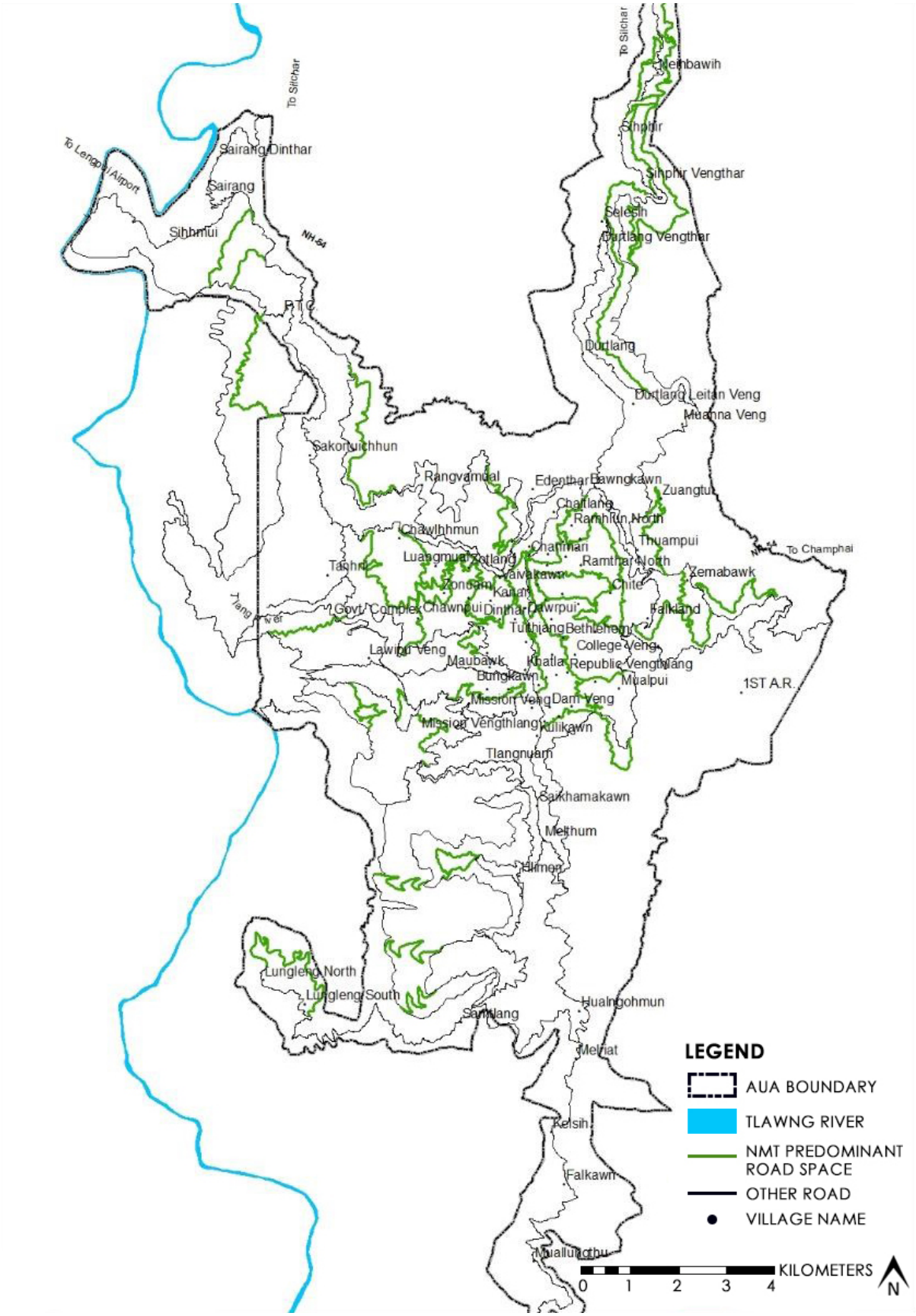


Figure 4.17: Proposed NMT predominant road space in Aizawl

Source: iTrans

4.3.6. Enhancing Safety and Security

Pedestrians are more susceptible to accidents and hence designing for their safety is paramount. There is requirement for safe crossings throughout the Aizawl city but there are few locations adjoining the public/semi-public land use like schools, colleges which require immediate attention. The intersections that require safe crossing are shown in Figure 4.18. These locations have been identified based on the proximity to schools, colleges, religious places like churches and first hand observation (includes conditions like poor road geometry, high speed traffic, no pedestrian crossings) of the city during the visit.

The following measures could be adopted to ensure safe NMT crossings:

Restructuring Intersections for fewer conflicts

The general design principles of intersection redesign are provided in Section 4.3.3. A roundabout may be proposed at intersections to ensure safety of pedestrians. Roundabouts reduce vehicular speeds and are hence recommended to improve pedestrian safety.

Safe Routes to Schools

Additional emphasis needs to be given to enhance safety for children walking to school. Safe routes to school (SR2S) programs are proposed in Aizawl to promote healthy lifestyles and safe mobility among children. Influencing children is also a long-term solution to bringing about a change in the perception of NMT. The SR2S programs will promote walking and cycling to school through educational initiatives and incentives with particular stress on safety and fun for the participants. SR2S programs will also address safety concerns of parents by encouraging greater enforcement of traffic laws, educating the public, and exploring ways to create safer streets.

The basic components of a SR2S program include:

- Encouragement – school commute events and frequent commuter contests are used to encourage participation
- Education – students are taught safety skills and educational campaigns aimed at drivers are developed
- Enforcement – various techniques are employed to ensure traffic laws are obeyed
- Engineering – infrastructure improvements are constructed to improve the safety of school commute routes

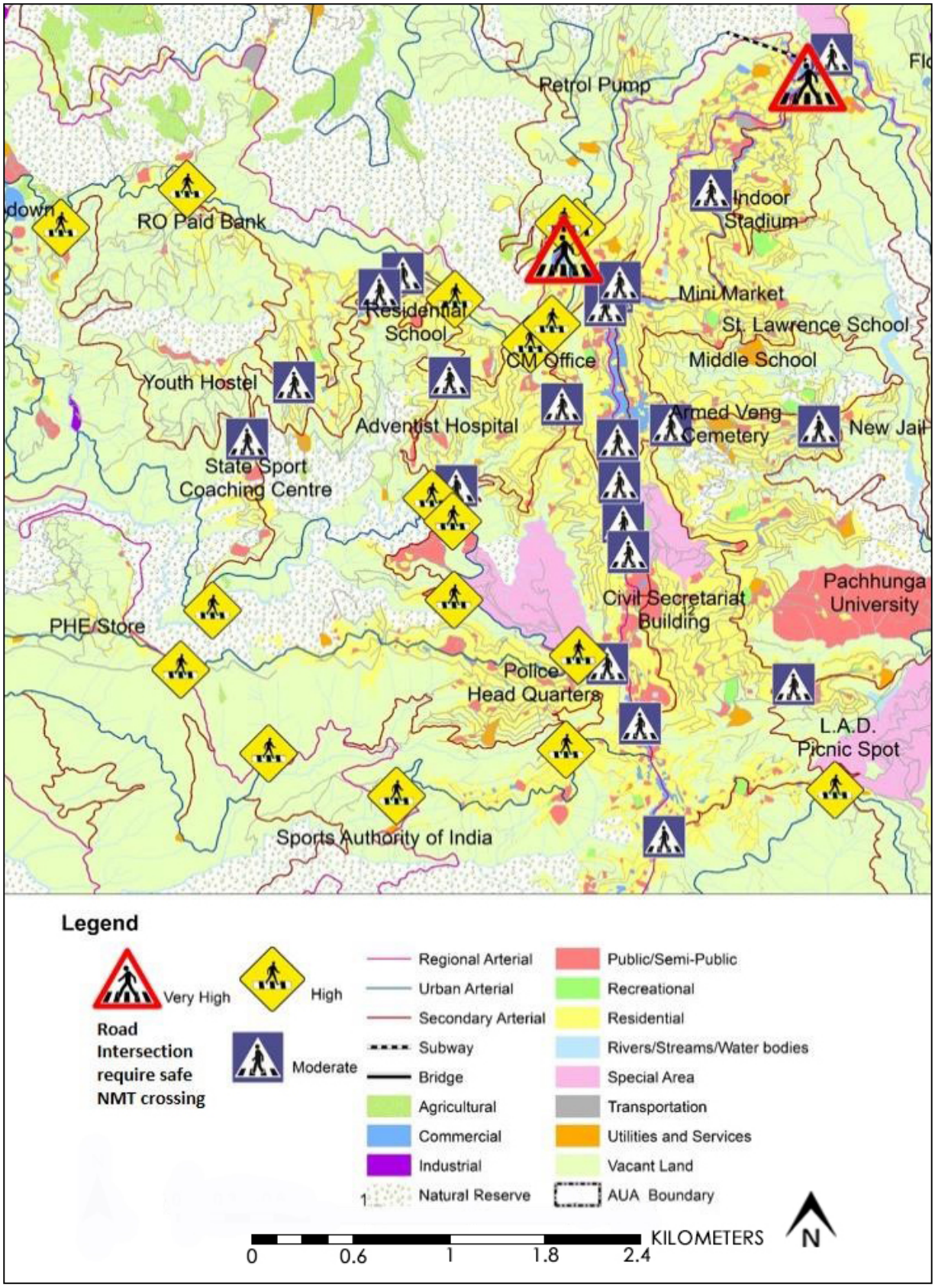


Figure 4.18: Intersections requiring safe NMT crossings

Source: iTrans

4.3.7. Information to Road Users

All NMT users need to be informed about their location and help in finding their route to their destination. The information can be provided to users in the form of signage, route maps, mobile phone applications, etc. There are generally two types of signage associated with NMT:

1. Identification - Signage that helps directly identify routes and destinations (Figure 4.19)
2. Way-finding - Signage that includes maps and signposts that orient people to points of interest or help people find NMT facilities. (Figure 4.20)

Figure 4.19: NMT signage in Basel, Switzerland

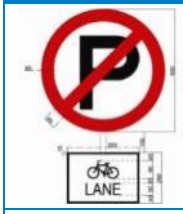
Source: IBI Group

Figure 4.20: Mobile app for way finding

Source: http://www.melendrez.com/project-categories/featured-projects

The following Table 4.9 adapted from the Non-motorised Design and Planning Guidelines, 2014 gives a summary of all the non-motorised signage to be used.

Table 4.9: Proposed NMT signage for Aizawl

REGULATORY					
					
Prohibited parking in non-motorised lanes: used to prohibit parking on the segregated cycle lane.	Cycle prohibited note - to prohibit cyclists from using elevated roads like flyovers and they should remain at grade for movement.	Compulsory cycle track/cycles only	Compulsory route for cyclists & pedestrians	Segregated cycle & pedestrian route	Compulsory route for cycles & buses
WARNING					
					
Cycle crossing	Cycle route ahead	Prohibited parking in non- motorised lanes: used to prohibit parking on the segregated cycle lane.	Common lane for cyclists and motor vehicles: to warn motorists of the cycle users, wherever the cycle track is painted and not segregated		
INFORMATORY					
					
Nmv parking: located at cycle parking areas.	**Nmv track**: indicating segregated cycle track	**Common cycle track and footpath**: used at locations where pedestrians and cyclists share the road	**Differently-abled environment**: indicated at locations which have wheelchair access and are accessible by the differently-abled.	**Ramps:** used to indicate locations of ramps at the subways and/or foot-over bridges, which are accessible by the differently-abled.	

Source: Planning and Design Guideline for Cycle Infrastructure by TRIPP & Shakti Foundation

4.4. Site-specific NMT Proposals

In addition to city-wide NMT recommendation, this section of the Plan provides site-specific NMT proposals for the core city area. These proposals are illustrated in Figure 4.21. The proposals are described further in this section.

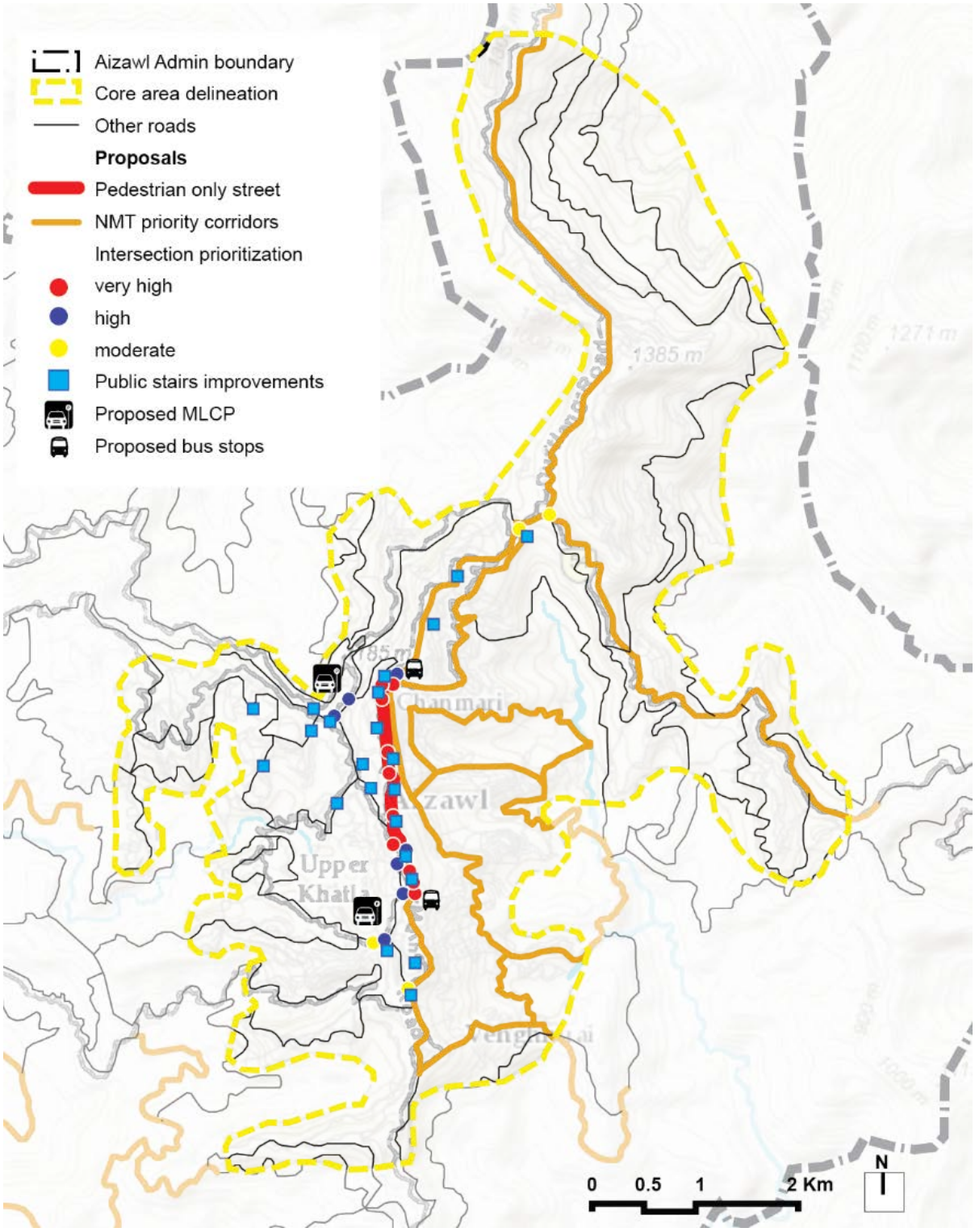


Figure 4.21: Map showing NMT proposals in core city area.

The NMT proposals identified for implementation in the core city area include:

1. **Pedestrian Street** - A portion of the commercial street between Chanmari to Dawrpui has been delineated for proposed pedestrianization. This will be supported by public transit service providing connectivity on either ends of the commercial street. This has been proposed as a signature project in the NMT Plan. The advantages of a signature project are explained below.
2. **Street Retrofits** – Over 9 street links are identified for NMT-friendly retrofits and are shown as NMT priority corridors.
3. **Intersection Improvements** – Over 15 intersections have been identified for improvements. From these, at least 8 intersections are identified to be of high priority.
4. **Public Stair Improvements** – 22 existing public stairs have been identified for improvements and upgradation. Depending on availability of space and observed usage, some of these stairs must be evaluated for conversion to escalators. 11 stairs that serve the proposed pedestrian street are selected for pilot implementation.
5. **Multi-level Car Park (MLCP)** – 2 public parking facilities are proposed to address issues of parking encroachment.

Prioritization of NMT Interventions

The site specific NMT interventions recommended earlier have been prioritised using the prioritization matrix provided in the NMT Guidance Document. The rating given to each criteria is based on stakeholder input and the issue and opportunity analysis.

Table 4.10: NMT Intervention Priority Matrix

Proposal	Accident Safety (1-20)	Current and Potential NMT Volume (1-15)	Contribution to NMT Network (1-10)	Ease of Construction and Maintenance (1-5)	Total (from 50)
Pedestrian Street - Chanmari to Dawrpui	18	15	8	1	45
NMT Priority Corridors	15	10	5	2	32
Intersection Improvements	20	10	8	2	40
Public Stair Improvements	20	15	10	2	47
Multi-level Car Park	0	5	0	4	9

Source: Adapted from Prioritization Matrix from National-level NMT Guidance Document, MoUD (2016)

Based on the preliminary prioritization, two interventions are identified for immediate implementation. The development of a Pedestrian Street is proposed as a signature project, because it has the potential to attract significant attention and support from the general public. Public stairs could be implemented as pilot projects incrementally. The signature and pilot projects are described in more detail further in this chapter.

4.4.1. Signature Project – Pedestrian Street

A signature project that will promote walkability and relieve congestion is proposed for the following reasons:

- High visibility projects can garner political support and media attention, which can help attract more funds for NMT
- Projects that are large enough, in scope and target beneficiaries, can have a significant impact on the quality of life
- Signature projects are demonstrative. Exposure to good planning and design principles can be created through signature projects
- Signature projects with significant stakeholder participation creates high ownership for NMT planning in the city
- Most importantly, signature projects generate traction for further investments in NMT infrastructure

The **pedestrianization of a 1.5km long stretch between Chanmari to Dawrpui** is proposed for signature implementation. This project has been identified through consultations with various city stakeholders and taking into account the concerns expressed by them. Currently this street is converted into a pedestrian plaza every year during the Christmas festivities. The signature project seeks to make this a permanent arrangement. Considered as one of the most important destinations in Aizawl, the Chanmari to Dawrpui stretch has the potential to become emblematic of the culture of prioritizing people over vehicles.

The 1.5 km length is considered optimum for encouraging walking without becoming tiresome. This project will support dual objectives of raising awareness about the benefits of sustainable mobility and contribute to placemaking. Innovative streetscape design elements are proposed to add beauty and provide a sense of place.

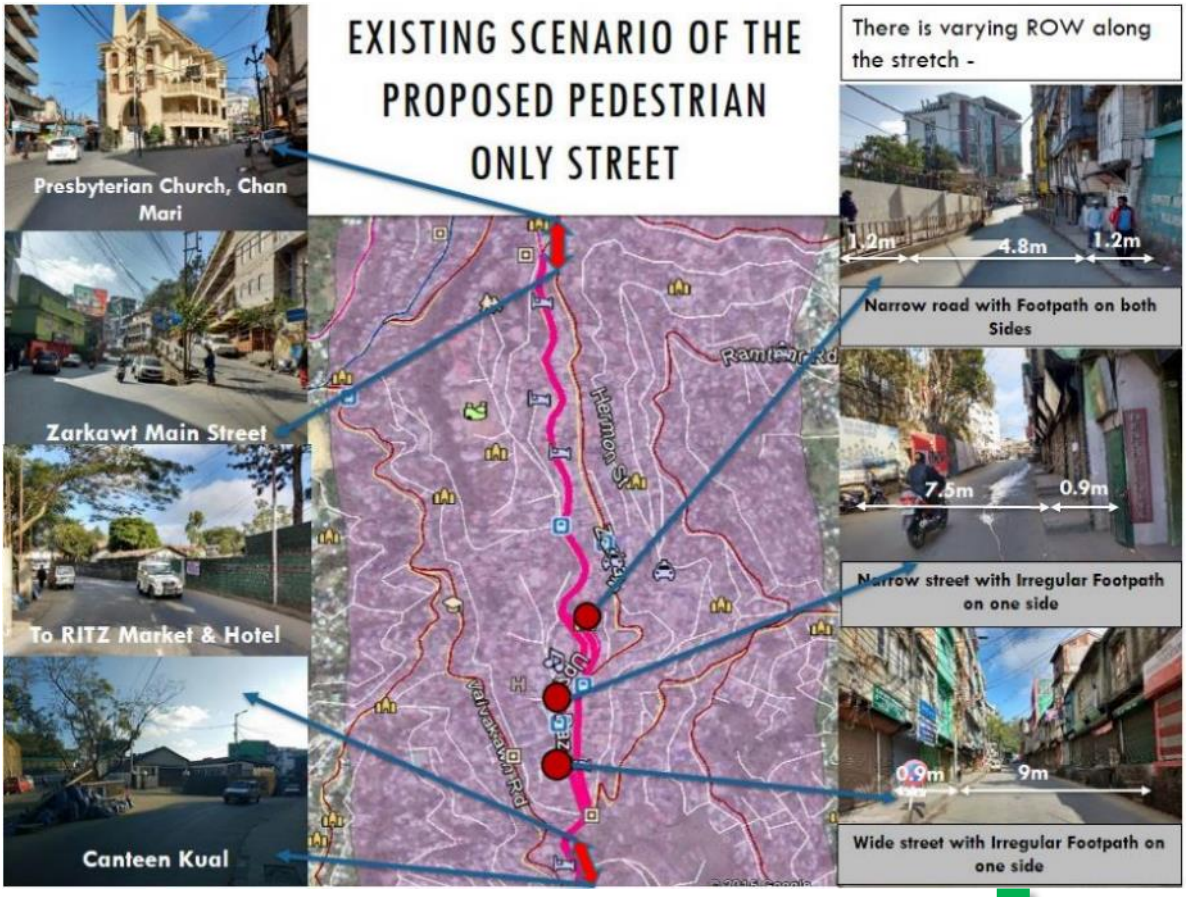


Figure 4.22: Existing scenario of proposed NMT corridor

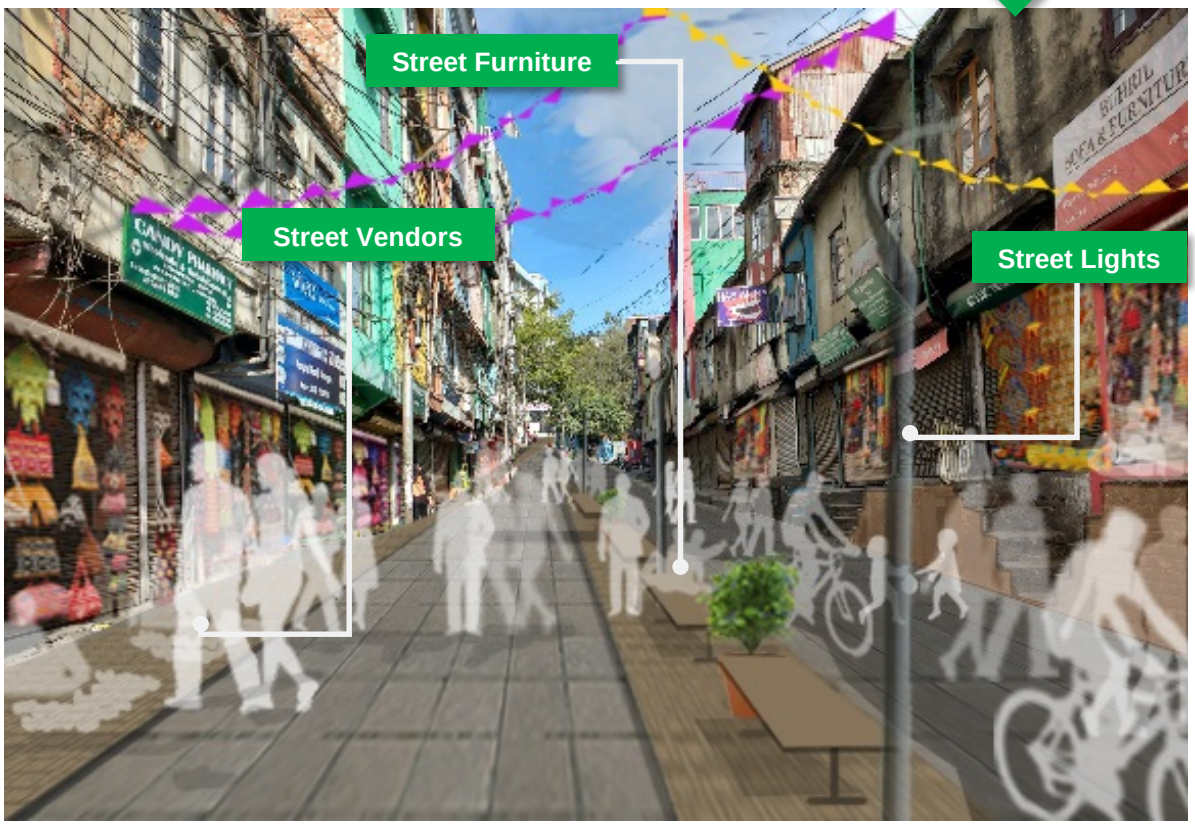


Figure 4.23: Proposed vision for the pedestrian street

Source: iTrans and IBI Group

The proposed Pedestrian Street passes right through the heart of the Aizawl city serving major institutional and commercial establishments (Refer Figure 4.24). Pedestrianization will provide ease of connectivity to pedestrians who pass through the area as well as those who are there for work or shopping.

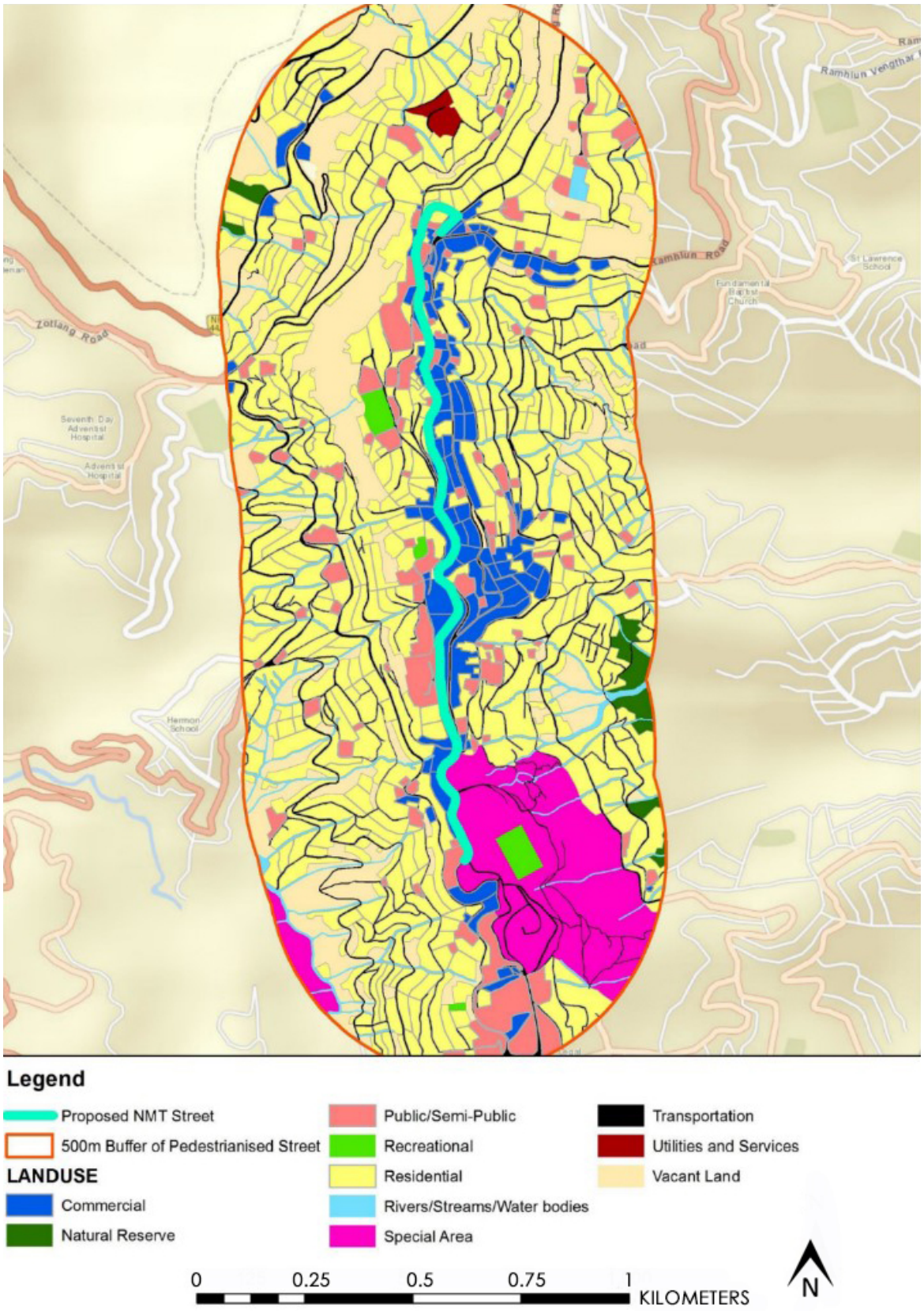


Figure 4.24: Proposed pedestrian only stretch in Aizawl

Source: Modified from Master Plan for Aizawl: VISION 2030, Aizawl Development Authority, 2011

A typical cross section of the proposed pedestrian street is shown in. The street is proposed to have a **central 2 meters wide median space with streetlights, seating spaces, along with 3 meters or more** on either side for walking and other NMT modes. Property owners abutting the street could also be incentivised to provide amenities like water fountains and toilet facilities.

Because the temperature in Aizawl is relatively cool throughout the year, and the street is flanked by 10 to 15 M high buildings on both sides allowing only 3-5 hours of direct sun light on a typical sunny day, it is not recommended to have central or side tree line. Instead, small local shrubs that don't hinder sunlight can be used for landscaping in the median with the streetlights at regular intervals.

A dense **mix of residential and commercial buildings fronting the street** should be continued and promoted as it encourages round the clock vibrancy and instils a feeling of safety among the pedestrians. Architecturally diverse building facades provide visual interest. Facades should avoid blank walls and plated glass. Vacant lots in the district should be taken up for priority development. Uniform shop front guidelines may be implemented Buildings in the district should have window displays, sidewalk cafes, art work, or interesting architectural design elements that help create a sense of place and welcoming environment.

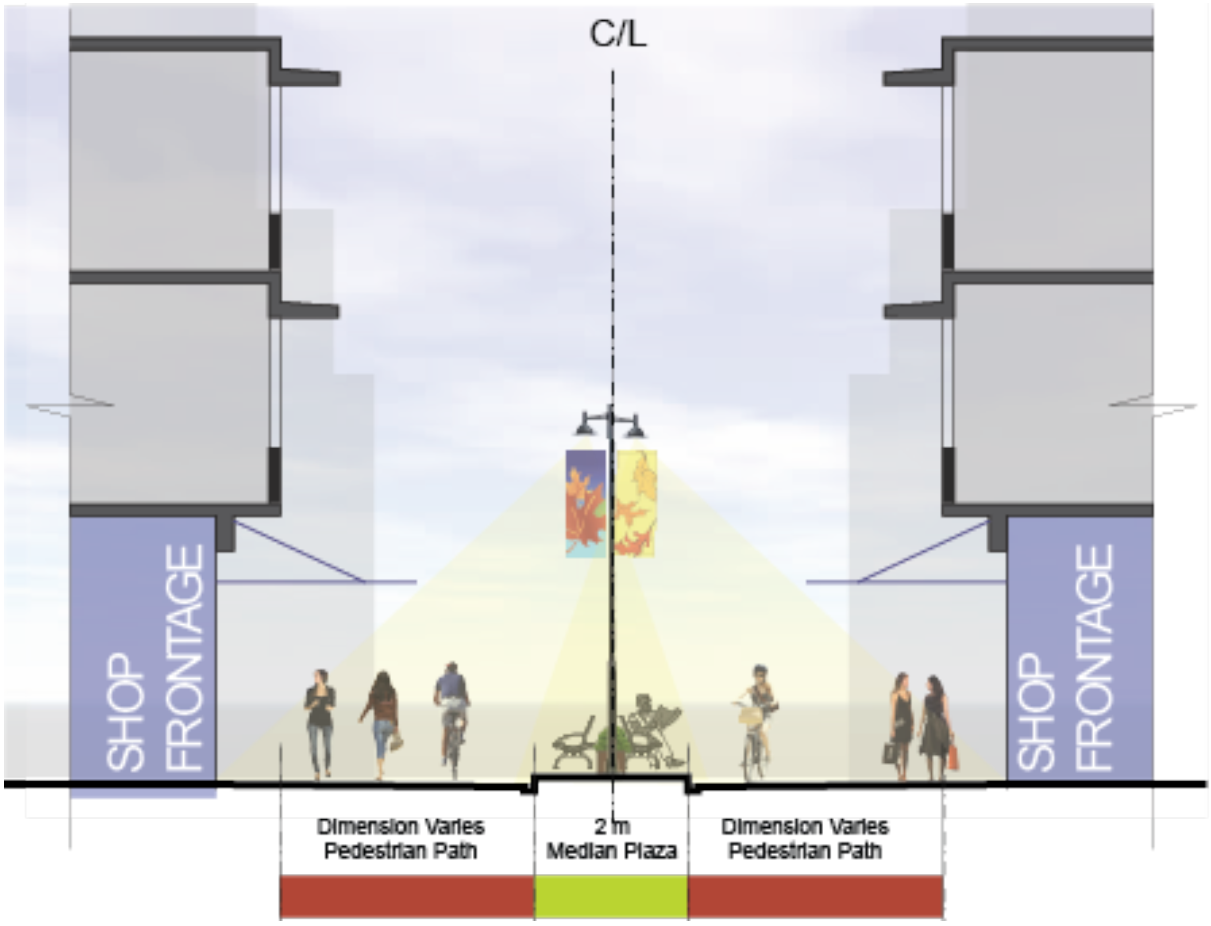


Figure 4.25: Proposed pedestrian street section

Source: IBI Group

Off street parking would need to be designed in the vicinity of the district on both the sides to encourage people to leave their vehicles and come to this area by foot. Direct pedestrian connections should be provided to parking lots, taxi stands, and bus stops. Walking routes should be well-lit when passing between buildings and along pathways within parking lots. The whole pedestrian district can

be lit with wall-mounted street lights.

A couple of **battery operated vehicles having an occupancy of 6-8 people** may be deployed within the pedestrianised district in order to ease movement for elderly, differently abled and people with goods on the pedestrianised street. Traffic flow by-passing the district should be restricted along parallel streets.

Currently, the identified stretch is pedestrianised during Christmas time for 3-4 days. At this time, all the motor vehicles use an alternative route which has been identified by the Traffic Department. This route is on the western side of the pedestrian street along Vaivakawn Road, a 3.5 km stretch joining Chanmari and extending up to Bawngkawn (Refer Figure 4.26). Another alternate route has been proposed, in consultation with the Traffic Department. This route is on the eastern side of the pedestrian stretch and is of 11 km. It was observed that, this stretch has sufficient ROW's throughout, to cater to the heavy vehicular traffic (Refer Figure 4.27).

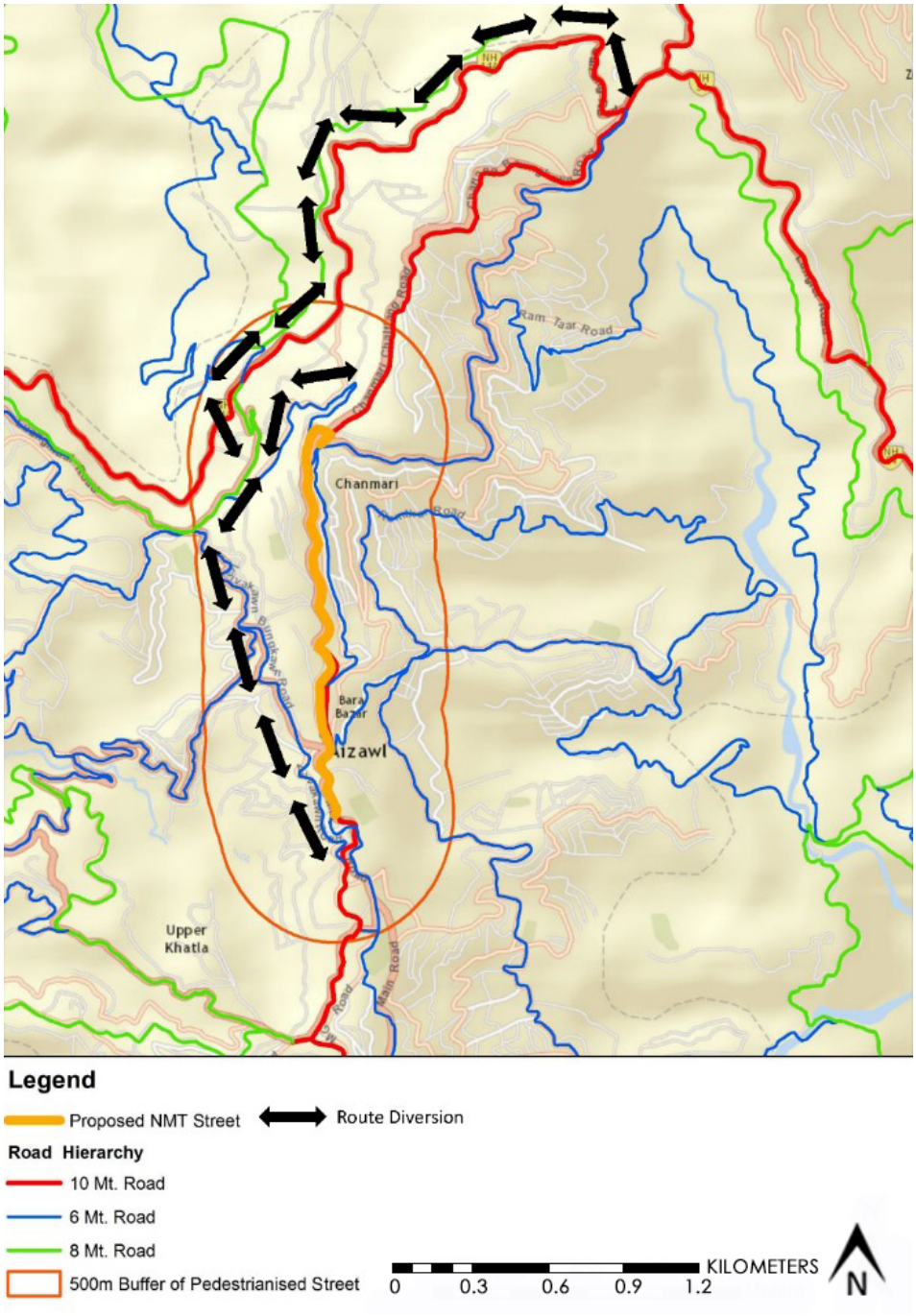


Figure 4.26: Proposed western side traffic diversion to enable pedestrianization

Source: Adapted from Master Plan for Aizawl: VISION 2030, Aizawl Development Authority, 2011

Figure 4.27: Proposed eastern side traffic diversion to enable pedestrianization

Source: iTrans

The pedestrian district needs to be universally accessible by constructing new and altered **"accessible" infrastructure** for persons of all abilities. Sidewalk width, ramp construction (including coloration, tactile warning, and placement), crosswalk markings, pavement materials, driveway approaches, pedestrian signals (including audible signals), and signal timing are amongst the most basic elements that directly affect pedestrian and wheelchair mobility.

In order to implement the pedestrianization proposal, the stretch needs to be incorporated as a pedestrian district in the **Aizawl Master Plan – both in the Transport Section and in Land Use Maps**. In addition to the master plan, localised plans of different parts of the district needs to be prepared so that it provides a detailed plan of land use and development within a more circumscribed part of a community. The specific plan must lay out design guidelines and improvements within the public right-of-way, including pedestrian improvements. Design guidelines and bye-laws need to be created to ensure that the new public and private development meets certain design standards and provides necessary pedestrian amenities. These plans should be used to assess the district and finance development.

Community and city based funding mechanisms would need to be put in place to ensure maintenance. Property owners must be required to pay a fee to cover special improvements such as landscaping, lighting or maintenance.

CASE STUDY: Pedestrianization at MG Road, Gangtok:

Pedestrianization measures have been taken at many Indian hill stations. Gangtok has pedestrianised, MG road, its central commercial spine frequented by locals and tourists for sightseeing and shopping. In addition to this, the Government is in the process of developing a walk-way with viewpoints, restaurant and cafeteria, toilet facilities, street furniture, solar lighting and other activities. Shimla and Matheran have adopted similar measures. The width of the central spine of Aizawl is narrower than that of Gangtok, which makes pedestrianization measures in Aizawl all the more imperative for easy and healthy mobility in the city.

Figure 4.28: Pedestrians walking along the MG road in Gangtok

Source: http://sikkimudhd.org/picture/remodelledmgmarg.gif

Figure 4.29: Streets are lined with benches and shrubs that don't block the sunlight

Source: https://subalcbasak.files.wordpress.com/2014/06/img_3546.jpg

4.4.2. Pilot Projects – Public Stairs

Pilot projects are experimental, quick-win projects that can provide planning authorities with retrospective insight about what works and what doesn't. Pilot projects enable learning from previous mistakes and using these lessons in future projects.

It is recommended that public stairs along the main commercial stretch (spine road) of Aizawl City be taken up for upgradation on a pilot basis. A number of issues have been identified on all these stairs such as absence of railings, long stairs with no landing, broken steps, poor lighting, and open utilities. Figure 4.30 shows eleven public stairs along the stretch that need improvements addressing the issues.

This stretch is highly accessed by the public on day-to-day basis due to the presence of important commercial areas, offices, hospitals etc. This stretch also acts a crossing between eastern Aizawl and Western Aizawl. Therefore, public stairs connecting this stretch are proposed to be improved first on priority basis and then, the public stairs of rest of the city should be improved.

Following are the public stairs identified along the commercial stretch –

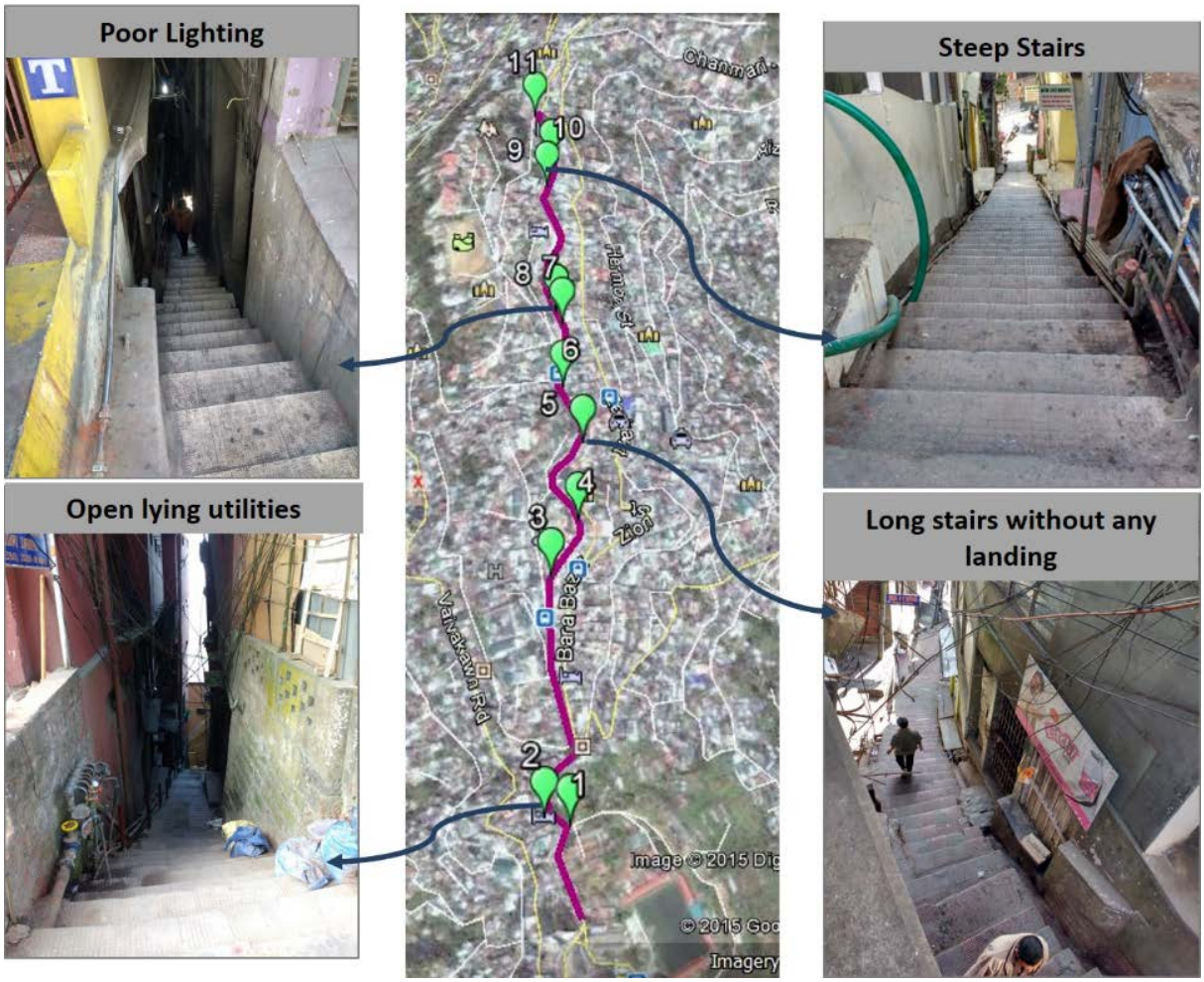


Figure 4.30: Site-specific public stairs which need improvisation.

Source: iTrans

4.5. Long-Term Interventions

This section includes recommendations for long-term interventions that will promote NMT modes and improve connectivity and mobility throughout the city.

4.5.1. Alternative Mobility Options

The CTTP 2011 proposes a ring road along the western edge of the city, adding one more connection to Lengpui Airport. In addition, the city must consider **ropeways as a potential mobility alternative to connect the city to the airport and remote locations**. Two potential ropeway corridors have been illustrated in Figure 4.31. Ropeways will function as public transportation and reduce the reliance of citizens and visitors on private vehicles or taxis.

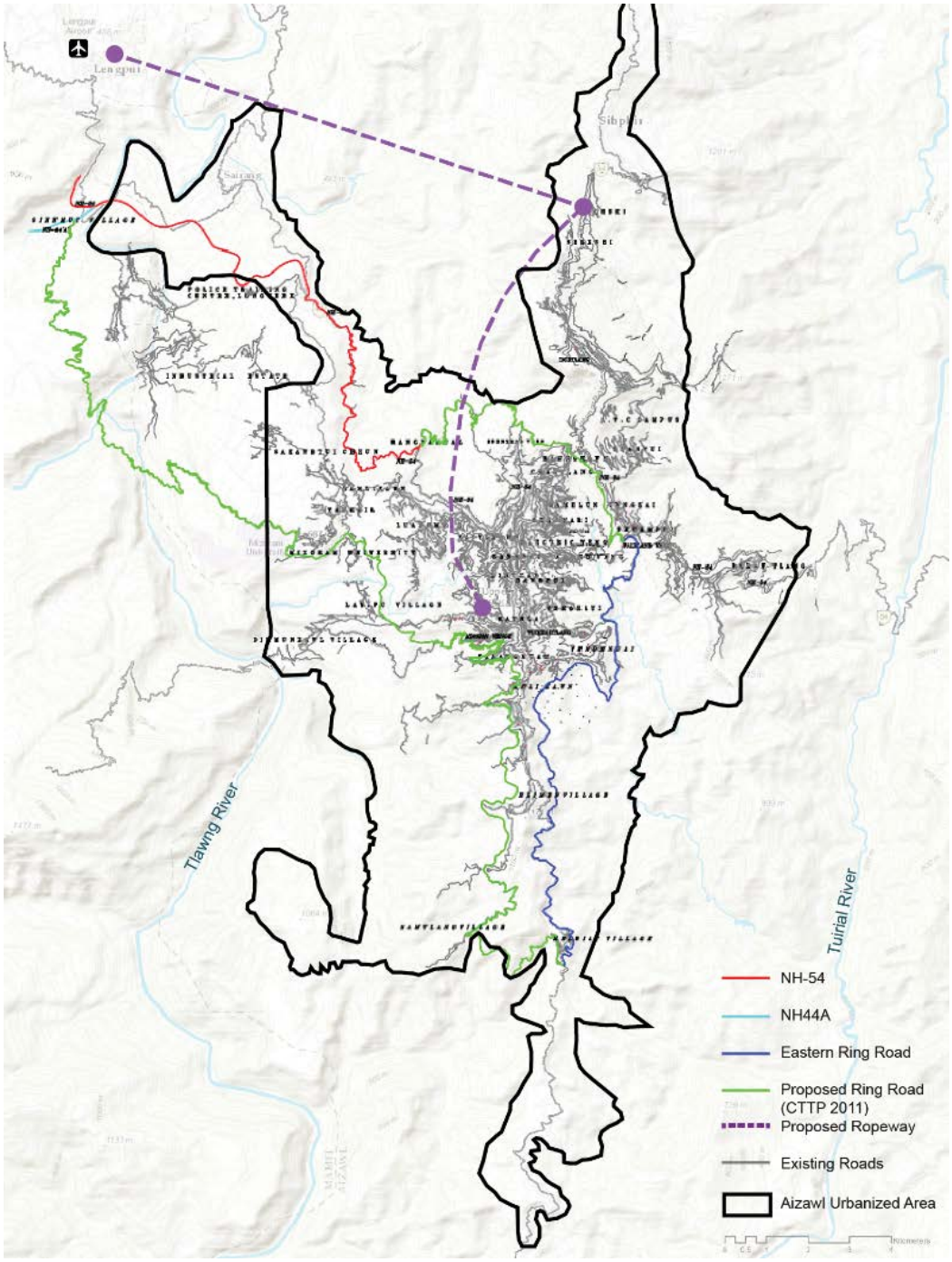


Figure 4.31: Long-term mobility proposals

Source: Adapted from CTTP 2011

Figure 4.32: Passenger ropeways in Gangtok, Sikkim

Source: http://ropeways.com/ropeway/

4.5.2. Cycling Network

While cycling is not currently a major mode of transport, there are increasing numbers of recreational cyclists and a clear political will to encourage cycling in Aizawl. The constrained road space in the city, low speeds of traffic and low current demands of cycling ensure that there is no necessity or possibility of creating segregated cycle tracks in Aizawl. Hence, a cycling network plan with painted lanes and shared streets have been proposed. Streets with more than 8m ROW and the potential to be converted to one-way streets may be considered to create a network of painted lanes for cycling (potential streets are shown in Figure 4.33). To ensure that these functions are implemented, a clear parking policy with strict enforcement is critical; else the lanes will be encroached by parked cars and 2 wheelers. On narrower roads, 6-8m in width are proposed to have space sharing of cyclists and motor vehicles (refer Figure 4.34).

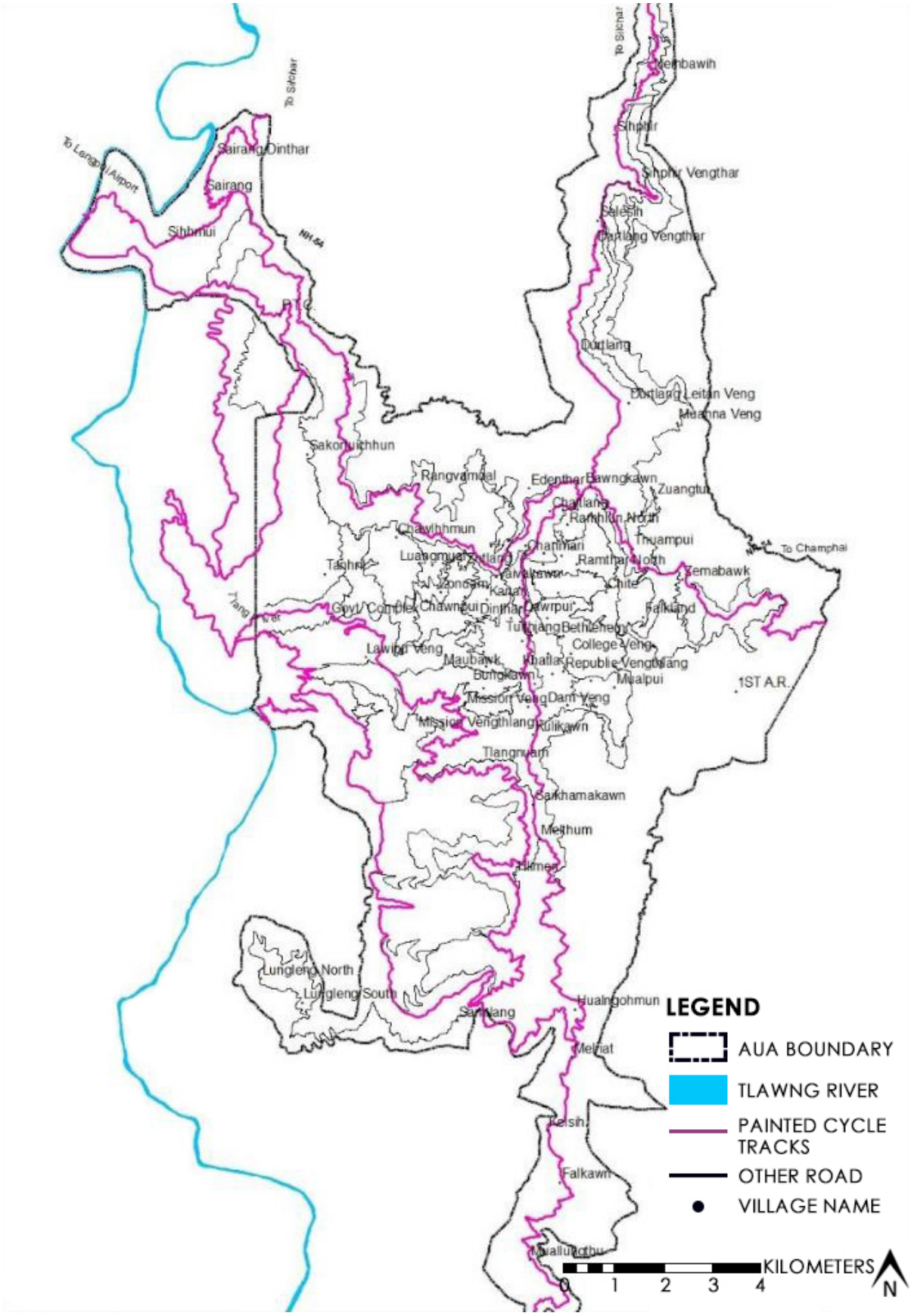


Figure 4.33: Proposed painted cycle lanes in Aizawl

Source: iTrans

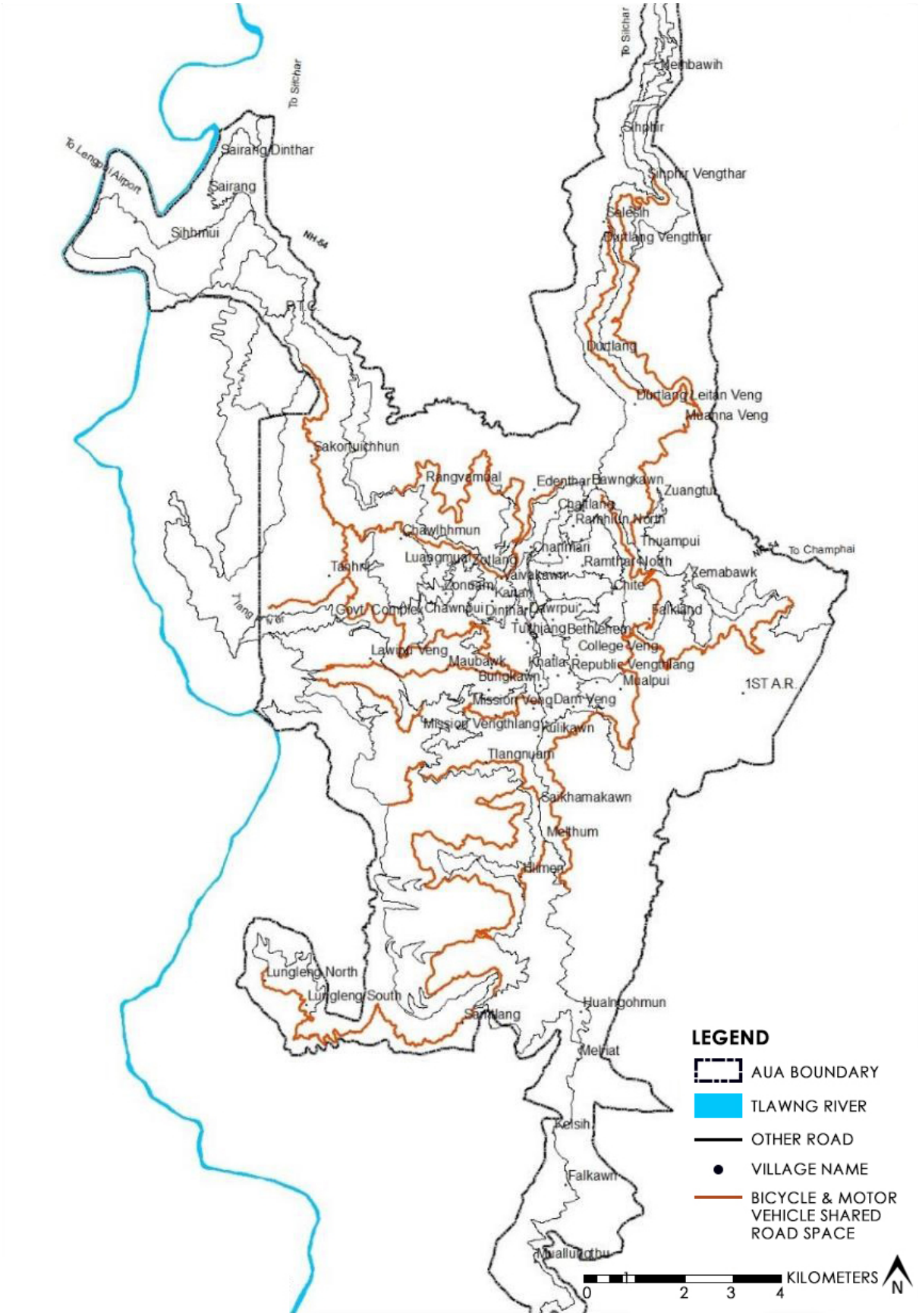


Figure 4.34: Proposed bicycle and motor vehicle shared road space

Source: iTrans

Figure 4.35: San Francisco, a popular hilly city for cyclists has 132 miles of bicycle routes
Source: https://spinlister-cities-assets.spinlister.com/assets/cities/San-Francisco/sanfranciscoone.jpg

4.5.2.1. Bicycle Renting and Public Bicycle Sharing

Developing a bicycle sharing or renting system in integration with public transport will not only increase the efficiency of public transport by enhancing its coverage, but it will also ease connectivity to bus stops. The map shown in Figure 4.36 highlights the location of possible bicycle sharing or rental stations in the vicinity of the existing bus terminals in Aizawl city. **Considering the impact of terrain on the willingness of people to shift to cycling, only relatively flat terrains are considered for bicycle sharing.**

The proposed bicycle sharing stations will provide much needed connectivity to commuters living in low density areas on the outskirts of Aizawl city. Commuters from these locations would be able to cycle to the nearest bus terminal and commute to the high density core by bus. This would reduce the dependency on private vehicles and also reduce congestion and parking requirements in the core city. Although many first and last mile trips are being conducted by walking, the poor condition of footpaths and public stairs pose a significant deterrent to the activity. Only captive pedestrians would choose to walk in such conditions. Therefore, it is strongly recommended to improve these facilities using design specifications discussed in the previous sections.

The locations of proposed bicycle sharing or rental stations within the coverage area of a typical Bus Terminal (Ch. Saprawnga Terminal) in Aizawl city is shown in the Figure 4.37. These bicycle stations have been located near major nodes including institutional, industrial, commercial (trip attraction points) and residential areas (trip generation points). Stations are located at 500m distance to ensure that a bicycle station is within walking distance from any location inside the bus terminal catchment.

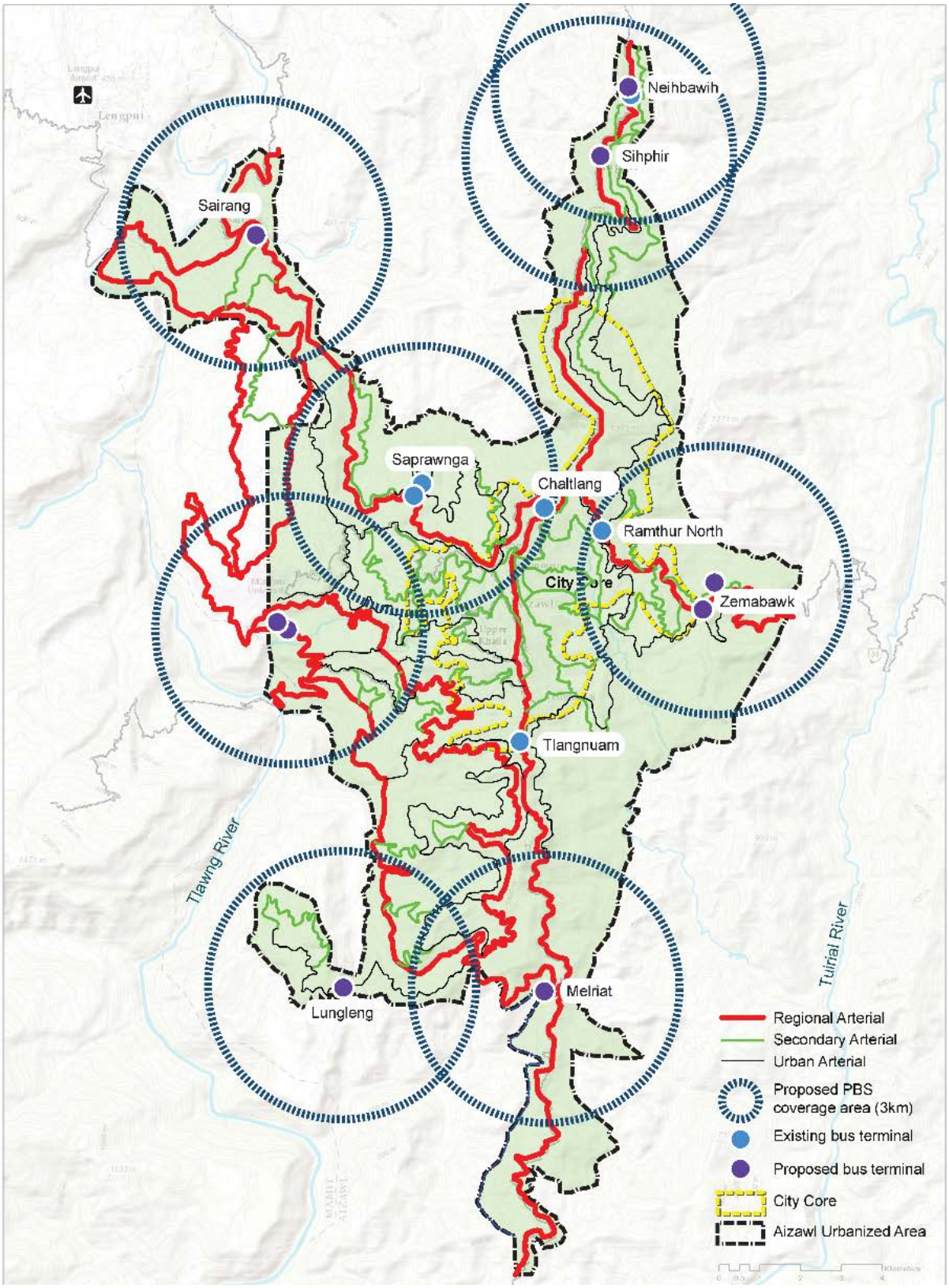


Figure 4.36: Proposed PBS and public transport integration in Aizawl

Source: iTrans

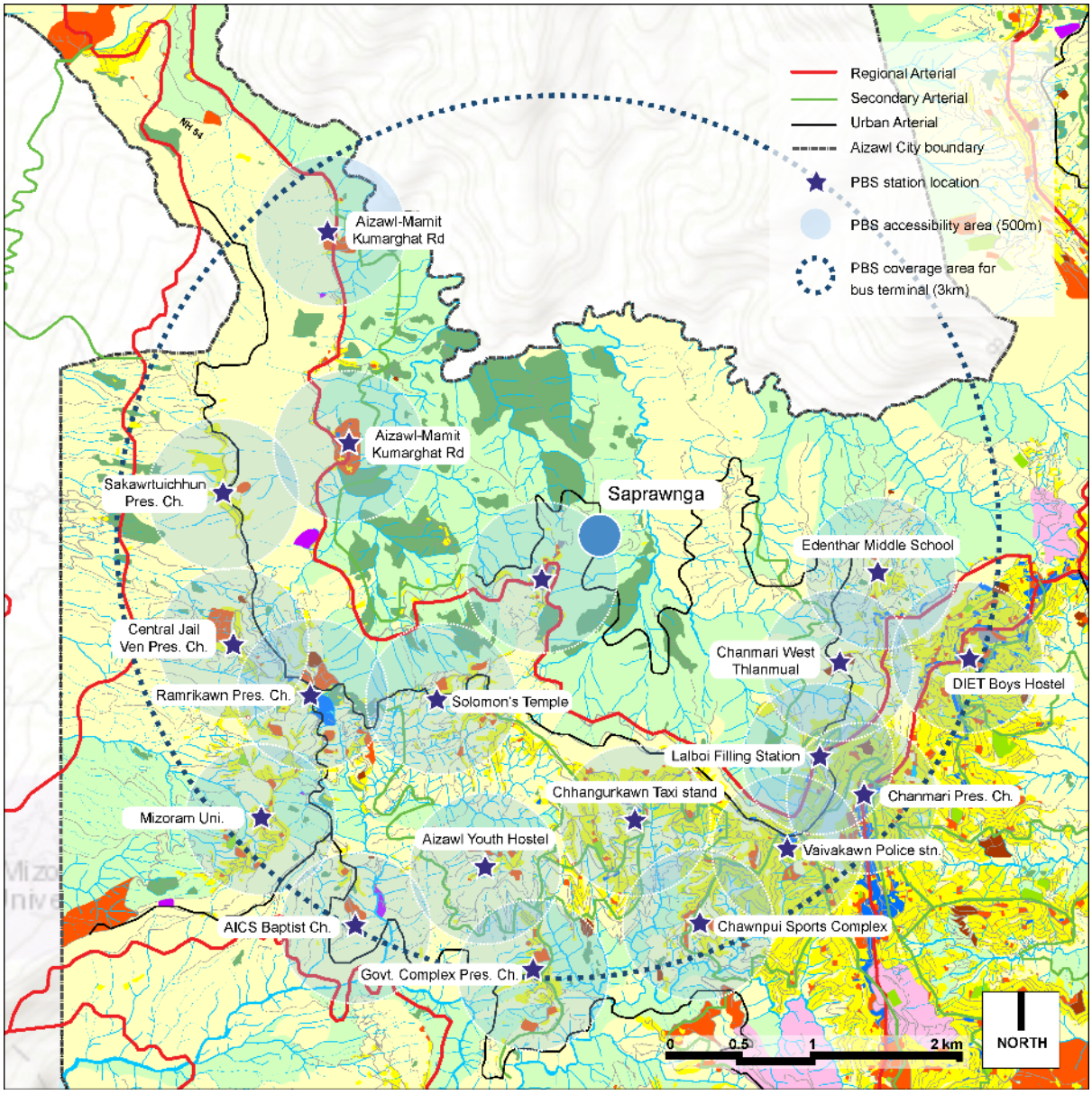


Figure 4.37: Distribution of bicycle sharing or rental stations in the Saprawnga bus terminal vicinity

Source: iTrans

The images below illustrate that most of the areas selected for bicycle stations are flat terrains and comparatively easier for cycling.

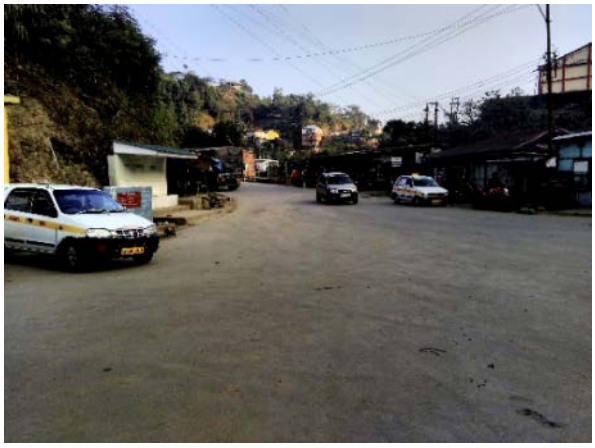



Figure 4.38: Ramrikawh Presbyterian Church
Source: iTrans


Figure 4.39: Solomon's Temple
Source: iTrans


Figure 4.40: Chhangurkawn Taxi Station
Source: iTrans

Figure 4.41: Mizoram University

Source: iTrans

Figure 4.42: Aizawl Youth Hostel

Source: iTrans

Figure 4.43: Vaivakawn local shopping area (near Rural Bank)

Source: iTrans

CHAPTER V: INVEST

5. INVEST

5.1. NMT in City Budget

The Aizawl city budgets for urban transport investment were analysed to identify funding trends and prioritization principles. This was used to understand where NMT investments could fit in. In Aizawl, it was clear that there is no allocation of money towards construction or maintenance of footpaths, cycle tracks etc. However, in the CTTP, costing requirements for footpath construction have been estimated (refer Table 5.1 and Table 5.2). The footpath length proposed by the CTTP is 42% of actual length of footpath required as per this NMT City Specific Plan. The cost estimate for proposed length of footpath is presented in Table 5.3.

An analysis of the AMC budget for the last three years reflects (refer Table 5.1) that allocation for transport projects was reduced from 67% of total expenditure in 2013-2014 to 38% in the budget estimate of 2014-15.

Table 5.1: Summary on the budget allocation by AMC (in INR)

S. No.	Description of item	Actual (2012-2013)	Budget estimates (2013-2014)	Revised estimates (2013-2014)	Budget estimates (2014-2015)
1	Roads and bridges	-	-	5,70,00,000	8,05,00,000
2	Public lighting	-	-	50,00,000	50,00,000
Total				**6,20,00,000**	**855,00,000**
3	Total municipal expenditure	9,46,84,629	8,43,00,000	9,21,38,000	22,54,72,000

Source: Summary of function wise budget, Aizawl Municipal Council

Under the 14th State Finance Commission, Aizawl has requested for provision of specific grants for urban infrastructure development plan for the city. Under the head of capital infrastructure for providing civic services, about Rs 4.0 crores each, over the next five year period has been requested for the upgradation of existing pedestrian facilities such as footpaths, foot over bridges and public stairs. Similarly, in order to enhance safety for pedestrians there is a need for investment in improving existing street light poles, relocating encroached street light poles and installing new street lights within the city**. A grant of Rs 10.0 crores for a period of five years (i.e. Rs 2.0 crores each year) has been requested for the purpose under this commission.**

However, provision and retrofitting NMT infrastructure facilities as per CTTP would require around **INR 57.65 Crore** which is approximately 6 times the budget allocated and grant requested under 14th State Finance Commission for providing the NMT facilities, indicating a significant funding shortfall.

Table 5.2 Cost estimate for NMT facilities in the CTTP 2011

Item	Unit	Quantity	Unit cost INR	Total cost INR	Remarks
Footpaths development on sides of main roads in core area	km	25	30,00,000	7,50,00,000	
Foot-over bridges	Nos.	3	3,30,00,000	9,90,00,000	
Public stairs maintenance, new stairs, improvements streetlights	Nos.	50	75,00,000	37,50,00,000	
Maintenance (one time)				2,75,00,000	Already exists, but not functioning
			Total INR	**57,65,00,000**	

Source: Modified from Comprehensive Traffic and Transportation Plan (CTTP) for the City of Aizawl, 2007

The recent capacity building workshop conducted by UD&PA Department in March 2015, highlighted that there is lack of organised Public Transport System and a Comprehensive Parking Policy to tackle on-street parking, vending zone management, coordination between departments, and citizen awareness. These are collectively posing huge barriers for sustainable urban mobility in Aizawl, especially for those who walk to work daily. The following table is the roadmap for guiding investment in the urban transport sector in Aizawl. It was developed during the capacity building workshop with the active participation of various departments representatives like PWD, AMC, ADA, Transport Department, TCPO, Police, UD&PA, and Sanitation.

Urban mobility solutions	Priority	Cost	Implementation time short <1, medium 1-3, long 3-10
BT (ITS, sheds, PBS, integrated)	High	High	Long
Parking Policy (including MLCP)	High	High	Medium (altering existing buildings)
Signages (including road markings)	Very High	Low	Short (2-3 months)
Pavement and staircase improvement	High (staircase not high)	Medium	Short
Elevators	High	High (O&M)	Medium
Taxi regulations plan	High	Low	Short
Organizing and regulating vending zones	Ongoing	Low	Medium
Awareness campaign plan (focused)	High	Low	Medium

5.2. NMT Costing Requirements

The cost of proposed lengths of footpath required in the city as per this NMT Master Plan is presented in Table 5.3**.** The total estimated cost of this proposed length of footpath is **approximately 4 times the estimated cost in the CTTP.** The authorities have underestimated the cost of investments needed for footpath construction. Thus it is strongly suggested to revise the allocation as per the actual requirement and look for other financing options discussed in the subsequent sections.

Table 5.3: Proposed footpath cost estimate

Link Description	Length (KM)	Total Cost (INR)
23 – 24 (Vaivakawn Market Area)	0.19	5,70,000
23 - 2 (Vaivakawn to Town Entry Point)	0.75	22,50,000
21 - 23 (Vaivakawn)	1.183	35,49,000
7 - 8 (Machhunga Point to Harimandir Intersection via Dawrpui)	0.28	8,40,000
3 - 2 (Near Hrangbana College): One Way	0.74	22,20,000
5 - 6 (Sumkhuma Traffic Point to Laldailova Point)	0.27	8,10,000
1 - 2 (Near Axis ATM): One Way	2.2	66,00,000
3 - 5 (Hrangbana College to Sumkhuma Traffic Point)	0.53	15,90,000
Za Sanga Point (19) to Selesih via Sihphir	15.5	4,65,00,000
11 - 17 (Zothasanga Point to Maenga Point)	0.12	3,60,000

Link Description	Length (KM)	Total Cost (INR)
Vaivakawn (24) to FCI Godown/Jail Area (22)	4.8	1,44,00,000
4 - 3 (Near Hrangbana College): One Way	0.099	2,97,000
1 - 4 (UTI Crossing to Hrangbana Traffic Point): One Way	0.089	2,67,000
7 - 6 (Machhunga Point to Laldailova Point via Millennium Center): One Way	0.42	12,60,000
24 - 25 (Vaivakawn Market Area to Aizawl Temple Crossing)	1.86	55,80,000
1 - 18 (Axis ATM to Kapthanga Point)	2.2	66,00,000
18 - 19 (Kapthanga to Za Sanga Point)	0.23	6,90,000
15 -Khatla Bazaar Area to New Capital Complex	2.2	66,00,000
16 - 25 (Ztu Kamlova Point to Aizawl Temple Crossing)	0.32	9,60,000
9 - 10 (Dr. C Thanthianga Point to Brig. C Vankunga Point)	0.28	8,40,000
6 - 7 (Laldailova Point to Machhunga Point via Bara Bazaar): One Way	0.43	12,90,000
10 - 11 (Brig. C Vankunga Point to Zothasanga Point)	0.06	1,80,000
17 - 12 (Maenga Point to R. Lalzuava Point)	1.11	33,30,000
8 - 9 (Harimandir Intersection to Dr. C Thanthianga Point): One Way	0.99	29,70,000
14 - 16 (Zokaithanga Point to Ztu Kamlova Point)	0.56	16,80,000
19 - 20 (Za Sanga Point to MULCO Intersection)	1.71	51,30,000
25 - 9 (Aizawl Temple to Dr. C Thanthianga Point): One Way	0.16	4,80,000
12 - 14 (Lalzuava Point to Zokaithanga Point)	0.49	14,70,000
Intersection 4 to Bara Bazaar Area	1.04	31,20,000
Zuangtui Intersection to RIPANS Area along NH-54	3.7	1,11,00,000
Intersection 21 to Lengpui Airport	13.97	4,19,10,000
12 - 13 (R. Lalzuava Point to Kulikawn)	0.95	28,50,000
14 - 15 (Khatla Bazaar Area)	0.07	2,10,000
Total	**59.5**	**17,85,03,000**

Note:

1. The per unit cost of footpath development is taken as 30 lakh as per CTTP cost estimation, 2010-11,
2. Since the cost estimate in CTTP is for the FY 2010-11 thus adjusting the cost for inflation rate the total cost estimate for FY 2014-15 would be INR 31,22,02,862.

Source: Adapted from Comprehensive Traffic and Transportation Plan (CTTP) for the City of Aizawl, 2007

The estimated cost for the signature and pilot projects have also been developed based on CTTP cost estimation. Assuming a unit cost of INR 60 lakh per km for pedestrianization, and additional INR 20 lakh for public outreach, the **estimated cost for the signature project is Rs1.1 Cr**. Assuming a unit cost for upgradation of public stairways of INR 75 lakh (as per CTTP 2011), the **estimated cost for upgradation of 11 public stairs connecting to the pedestrian street is INR 8.25 Crore**. It is recommended that one public stair be taken up on pilot basis before all public stairs near the pedestrian street are improved. Upgradation to escalators is estimated to cost INR 1.2 each (as per 2015 costing).

5.3. Alternative Financing Sources

Within the government and private investment processes, there is a need to create unconventional financing sources to finance NMT projects. Some examples of these sources can be:

- **State Transport Duties Revenue Reallocation** – state government should earmark a fixed portion (for NMT infrastructure provision) of revenue collected from imposing various transport duties like MV licencing, octroi etc.
- **Capital Market Funds** - State government should support smaller ULBs to access the capital market through Pool Financing. Like in Tamil Nadu, the Tamil Nadu Urban Development Fund (TNUDF) was established to provide small and medium ULBs access to capital market. While doing so State Govt. may specify the financial performance benchmarks for the ULBs like maintaining 1.25 Debt Service Coverage Ratio.
- **Land Monetization** – government should charge the owner a reasonable percentage of market value of land in lieu of the increase in the market value of land due to proposal and implementation of sustainable transport infrastructure projects in the vicinity.
- **Advertisement Revenue** – government should formulate a committee for integration of advertisement revenue, from different sources like bus shelters, buses, road space etc., for funding parts of NMT infrastructure like guarded bicycle parking system, PBS system etc.
- **NMT Fund** – state government should establish the NMT fund to promote the implementation of NMT projects and assist Municipalities in funding NMT related road infrastructure improvement.
- **Transportation Alternatives Program (TAP)** - TAP is a competitive grant program that could use central transportation funds for specific activities that enhance the intermodal transportation system and provide safe alternative transportation options walking and cycling.
- **Congestion Mitigation and Air Quality Improvement Program** - to achieve and maintain healthy levels of air quality by funding transportation projects and programs.

Aizawl Transportation Fund can be proposed for Aizawl which could become the financing tool to fund various non-motorised projects.

NMT projects are often too small in size and scope to be attractive for funding. Also they are difficult to implement without intervening with other systems. They can then be bundled with other larger projects to make them financially attractive and implementable. Some of the projects they can be combined with are:

- **Urban Renewal Projects:** Urban regeneration and renewal projects focus on improving public spaces and accessibility and can naturally include up-gradation of sidewalks, cycle tracks and other NMT friendly infrastructure.
- **Public Transit Projects:** The implementation cost of making good bus systems can easily absorb the costs of providing better access facilities to transit and invest in good sidewalks, cycling infrastructure and parking for NMV modes.
- **Heritage and Tourist area Plans:** walking and cycling infrastructure has a symbiotic relationship with heritage and tourist areas as a lot of domestic and foreign visitors walk and cycle in these areas. Also there is focus on public spaces and green areas which makes it perfect for walking and cycling.
- **Other Initiatives** like decongesting cities, making green cities, making smart cities etc., can easily incorporate NMT projects in their agenda.

Green Financing options can be created from the city by taxing use of private vehicles under the “polluter pays” principle. These can be in the form of

- **Private Vehicle Taxation** – government should levy tax on private motorised vehicles on annual basis for usage of the road like it is practiced in case of buses.

- **State Transport Duties Revenue Reallocation** – state government should earmark a fixed portion (for NMT infrastructure provision) of revenue collected from imposing various transport duties like MV licencing, octroi etc.
- **Parking Ree Increase** – free parking in any part of city should be abolished and wherever parking's are provided parking charges should represent the actual market value of the land, e.g. INR 400 per hour in commercial areas in Delhi.
- **Maximum Parking Norms** – government should abolish the current minimum parking norms in building bye laws or development control roles and it should implement the maximum parking norms. In addition, there should be high amount penalties for violation.

Additionally, Climate financing options available internationally can be tapped to generate financing for NMT projects as they fit into the mitigation and adaptation proposals to reduce GHG emissions. These can be availed from a variety of funding institutions and under the Nationally Appropriate Mitigation Action (NAMA) plans that the Country supports.

CHAPTER VI: IMPLEMENT

6. IMPLEMENT

Implementing and executing an NMT plan or project on - ground is a complex task not only because of issues faced while implementing street upgradation projects, but also because of the multiplicity of stakeholders involved. It involves organizational framework for implementation, community engagement and outreach, project management and supervision; and monitoring and evaluation.

6.1. Organizational Framework Roles & Responsibilities

The implementation of NMT facilities would involve a variety of stakeholders. The Public Works Department (PWD) of Aizawl is undertaking the present system of planning and implementation works for transportation infrastructure in the city. However, all authorities and agencies should be involved in the planning, designing and implementation process in order to achieve smooth and complete implementation.

The non-motorised transportation system includes an array of varied components from paved shared-use paths to public stairs, road shoulders, sidewalks and streets. Ideally, these should be integrated and operated as seamlessly as possible, offering citizens and visitors a first class system. Because there are multiple agencies with different but complementary missions, coordination and cost-effective management and function is essential. Table 6.1 covers all the stakeholders involved and their roles and responsibilities.

Table 6.1: Roles and responsibilities of stakeholders

Stakeholder	Potential Roles
Politicians	• Build commitment and motivate the society • Enact regulatory changes, if necessary • Ensure cooperation between various agencies
PWD, Aizawl	• Ensure integration of the system with bicycle infrastructure like signage and signalling under PWD to support increased bicycle traffic volume • Provide space under PWD jurisdiction for walking and cycling infrastructure • Ensure implementation of all NMT facilities
Aizawl Municipal Council	• Provide space under AMC jurisdiction for walking and cycling infrastructure. • Ensure integration of the system with public facilities • Provide Advertisement permission for various locations along the NMT routes in the jurisdiction
ADA	• Provide space under ADA for walking and cycling infrastructure.
Transport Department	• Ensure integration of the system with walking and bicycle infrastructure like signage and signalling to support increased pedestrians and bicycle traffic volume • Ensure check on growth of motorised vehicles • Ensure proper installation of advertisement according to the guidelines • Ensure integration of public bicycle infrastructure with bus infrastructure under • Promote the use of public bicycles to current bus users
Town and Country Planning Organization (TCPO)	• Provide space under AMC jurisdiction for walking and cycling infrastructure • Ensure integration of the system with public facilities • Provide advertisement permission for various locations along the NMT routes in the jurisdiction
Police	• Maintain a safe environment for walking and cycling • Enforce the traffic rules for safety • Protect the city from theft and vandalism of the public facilities and infrastructure

Source: IBI Group

6.2. Community Engagement and Outreach

Citizens as one of the important stakeholders if brought together, could help in streamlining whatever initiatives or campaigns (refer Figure 6.1) are undertaken later. It is important to engage with citizen groups and NGOS at every point of planning, as they are very important stakeholders in creating demand for sustainable transport projects in the city and its acceptance. Innovative methods could be figured on how they could be approached in the most resource efficient way. Informing the community about the plan update and seeking their experiences in walking and cycling in Aizawl can be accomplished through following ways:

- Posting information on the AMC website, running display ads in the newspaper and public buildings, being interviewed on local radio shows and running public service announcements on the radio before public meetings.
- Hosting regular public meetings in different locations throughout the community to explain the project, answer questions and encourage people to design routes they use, wish to use, and desire to be improved as they walk, bicycle or use other non-motorised transportation to get around their neighbourhoods and the community.
- Contacting and meeting with agencies or stakeholder groups such as the RWAs, Bicycle Club, TPCO, AMC, UD etc. to ensure inclusive participation in the planning process.
- Developing a project questionnaire to solicit written, mapped and emailed comments and ideas on walking and biking destinations, missing links, safety concerns and other obstacles along the routes.

Figure 6.1: Pedestrians wearing walk mobile in a campaign, Colombia

Source:http://ideiasgreen.tumblr.com/post/60036155380/ciclistas-simulam-o-espaco-ocupado-por-veiculos

6.3. Project Management and Supervision

City staff should produce a set of key guidelines as instructions for the agency implementing and executing the design. Transfer of a well-conceived NMT infrastructure plan on site, demands good communication between design agency, project managers and the contractors in order to explain instruction on use and interpretation of drawings. All drawings should be well referenced with detail drawings including signage and marking designs. They can also be made to suit various contractors employed like civil, electrical, drainage, etc.

- **Preparation of Construction/Working Drawings:** All alignments and design details should be done on the total station system and not moved, since each point on drawings refers to a location on site as per the co-ordinate system of the drawing.
- **Project Manager and Quality Surveyor**: Apart from assisting the employer in quality control and billing, the role of project manager (PM) is to ensure that there are no discrepancies during the process of transfer of drawings to site. PM ensures two way communications between designer and the contractor.
- **Site Layout and Inspection:** Accurate site layout of digital working drawings of an NMV facility is critical to accurately replicate design features essential for ensuring usability and safety.
- **Site Inspection Procedures** (refer Figure 6.2): At all stages of construction, there should be no compromise of safety of road users as well as workers on site. There should be periodic inspections to maintain the quality of the project execution.

Figure 6.2: Traffic diversion and manned supervision during construction

Source: Non-motorised Transport Planning and Design Guideline, 2014

6.4. Enforcement

Enforcement by the city traffic police is needed against violations of motorised vehicles entering sidewalks and cycle tracks, parking on them, over speeding, traffic signal violations, etc. The following enforcement strategies are suggested:

- Stationing of trained policemen or marshals at each entry to cycle lane/track (far or after side of the junction), to direct unauthorised motor vehicles outside the infrastructure.
- Policing and citations at junctions towards the end of cycle paths.
- Recording of violations for secondary fines and citations using video cameras should be conducted in addition to manual enforcement.
- Utilise “tow-away” methods in no parking zones, extensively during first few weeks after completion of an awareness drive and at intermittent intervals subsequently.
- Impose parking fees through parking meters or other appropriate measures at on street parking locations in the busy areas of the city. This should be followed up with hefty fines in case of non-payment of fees.
- Differential parking fee to be introduced at different locations and times to encourage use of public transport as opposed to private vehicles in congested parts of the city and during most congested periods.

A nodal officer responsible for enforcement of planning, actions and strategies on road also needs to ensure action as per pre-planned strategies in case of any eventuality on the corridor. This mechanism should include linking with a central command/control centre, with an assigned coordinator.

Specific design and training elements that can assist in enforcement are as following:

- Introduction and awareness on new road order through; media campaign, sign boards and assistance by personnel manning the facility.
- Specifically designed, sign boards, pavement marking, reflector studs and light beacons to assist motorists in specific lanes at the beginning and end of segregations or change of segregation type.
- Specifically designed sign boards and marking in line with listed violations such as those in motor vehicle act; for example speed limit signs, and 'no entry signs' for specific modes at the entry exit of bus and cycle lanes.

6.5. Monitoring and Evaluation

Appointing an expert team (from the government system or third-part consultants) for the monitoring and evaluation of overall NMT policy performance and to ensure its effective implementation can be useful for the project. The M & E team should comprise of representatives of the NMT cell, the implementing agency, the UD & PA department, a NGO/advocacy group supporting walking and cycling and others. The strategies to be followed by the M & E team should be as follows:

- Focus on direct outcomes of the projects that have been carried out paying attention to the development of knowledge, arguments and instruments.
- Assess the impacts achieved by the project as per pre-developed quantitative verifiable indicators.
- Conduct user satisfaction surveys on a monthly basis in order to improve the system for the users.
- Develop a post -project audit format to monitor the project costs and benefits in the short and long terms for the targeted beneficiaries.

The key objectives for the evaluation of a NMT route/network is to assess and reason the following:

- If the network/infrastructure has succeeded in sustaining existing and or attracting additional use along the route
- If the type of infrastructure developed is appropriate to the environment, road or context in which it has been used
- If the infrastructure developed manages to attract/serve existing users already on the road network
- If the infrastructure succeeded in improving safety of bicyclists along the route by design

6.5.1. Auditing

Auditing NMT facilities is important to understand the overall functioning of the provided infrastructure. It informs the need to upgrade and maintain certain areas that shall lead to better functioning and safety. In Aizawl city audit case may refer to network, route or corridor as the NMT infrastructure cannot be planned or implemented in isolation. When a corridor or route is desired to be audited, the audit cannot be conducted for NMT infrastructure independent of the context or in relation to the context. The auditing has to be done by the NMT cell on a yearly basis or completion of project whichever comes first. In the Urban Road Safety Audit Toolkit ((MoUD), 2013), the audit selection is based upon road type and context. In this case, three different points of view (pedestrian, cyclist and motorised vehicle) for each of these roads will be integrated with 12 identified indicators. A sample audit form for arterial or sub-arterial street can be seen as Annexure.

If the system is well maintained, it will assure both safety and enjoyment of the residents and visitors who use it. Pedestrians and cyclists are more susceptible than motor vehicles to roadway irregularities such as potholes, broken glass, and loose gravel. The following are some of the specific measures that need to be ensured:

- Potholes and cracks along the shoulder of roadways primarily affect bicyclists and should be completed within a timely manner. All repairs should be flush to the existing pavement surface.
- When repaving or maintaining roadways, drainage grates should be inspected to ensure that grate patterns are perpendicular to the road. Replacement of bicycle unfriendly drainage grates should be a standard operating procedure.
- When streets are resurfaced, utility covers, grates and other in-street items should be brought up to the new level of pavement. Similarly, the new asphalt should be tapered to meet the gutter edge and provide a smooth transition between the roadway and the gutter pan.
- Shared-use paths require regular maintenance, including trimming adjacent vegetation, sweeping, ploughing, and removing trash and debris. The Aizawl Municipal Council should develop a schedule for these routine items and should consider assigning staff to monitor the pathways on a weekly basis to proactively identify maintenance needs.
- Maintenance staff and contractors should be made aware of non-motorised related maintenance policies. Maintenance workers should be involved in the development of bicycle, pedestrian and trail-related maintenance policies in order to ensure that staff and understand the users' needs and limitations. After establishing policies, procedures can be established to verify compliance.
- A maintenance endowment can be established through private sector and non-profit fundraising to ensure long-term operations and programming needs can be met, in cooperation with public sector funding. AMC, PWD, UD should encourage and support these types of fundraising efforts.

APPENDICES

Appendices

Appendix A: NMT Audit Form

NMT AUDIT FORM - ARTERIAL / SUB ARTERIAL STREETS

INSTRUCTIONS

1 **In SEC A, tick mark or fill the form**

2 **In SEC B , for mid block fill points 1-25. For intersections fill points 1-30**

3 **For an arterial road and max speed limit 50 km/h, a segregated cycle track is compulsory on both sides**

A	**Audit Area**	Existing Infrastructure	☐	Planned Infrastructure	☐		
2	**Road Type**	Arterial/Sub Arterial	☐	Collector	☐	Local	☐
3	**Right of Way (ROW)**	☐ m					
4	**Length of Audit Area**	☐ m					
5	**Posted Speed Limit**	☐ km/h					
6	**Amenities (hawker spaces, etc.)**						
	☐	**Pedestrians provided some good amenities and feel safe**					
	☐	**Limited number of provisions for pedestrians and slightly uncomfortable at late nights**					
	☐	**No amenities and Unsafe**					
7	**SPEED MEASURES**	Maximum Speed Observed for Motorised modes	☐ km/h				

8

Volume Measures	Cycle	Hand Drawn Rickshaws	Pedestrian
0-10min			
10-20min			
20-30 min			
30 - 40 min			
40 - 50 min			
50 - 60 min			
Average Volume			

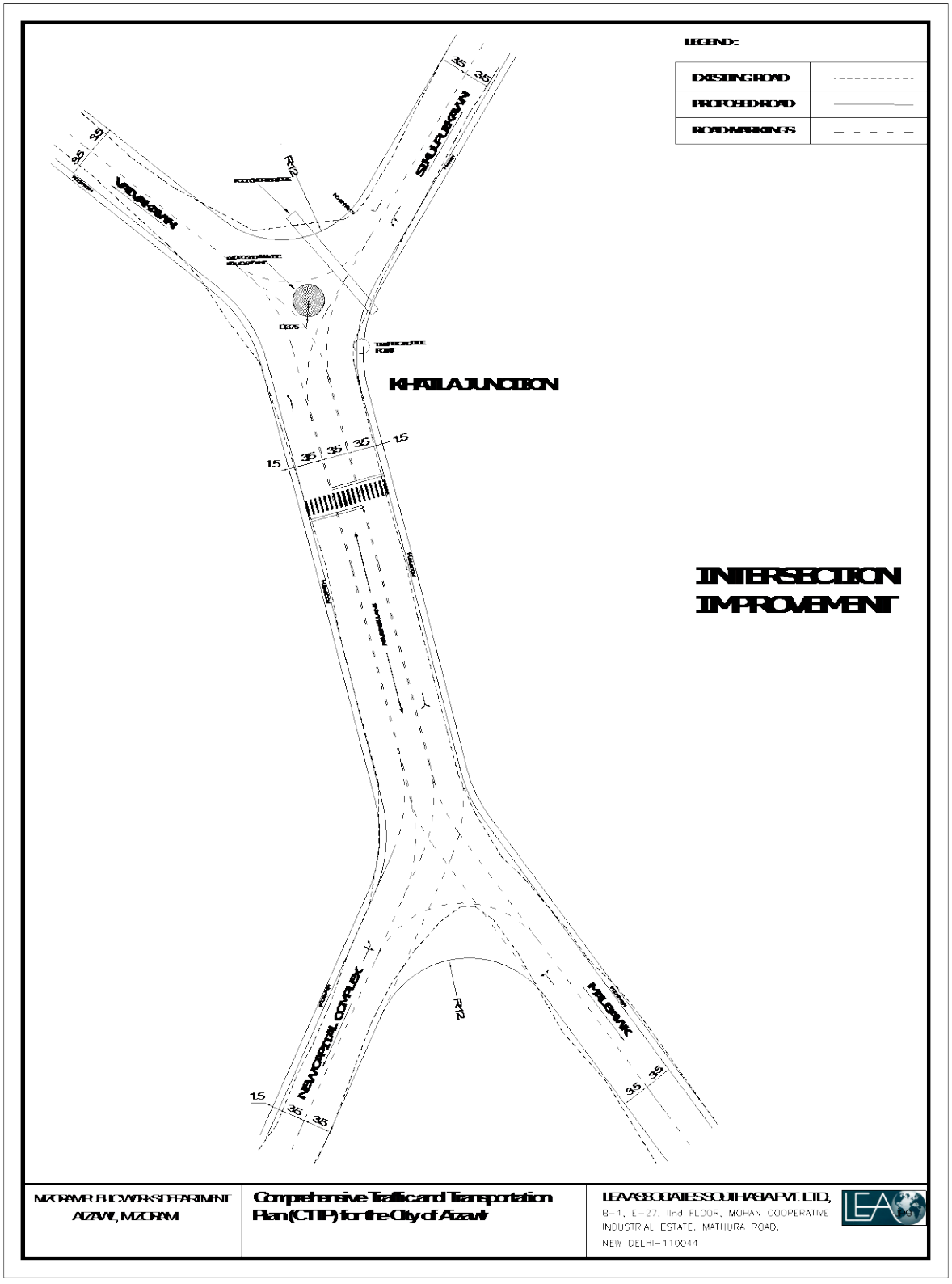
B	Arterial / Sub Arterial	Present / Yes (1 pt.) Absent / No (0 pt.)	Good (1 pt.)	Fair (0.5 pt.)	Poor (0.2 pt.)	(AxB)
1	**Width of cycle track**		>=2.5m - 5.0m	<2.5m - >=2.2m	< 1.8m	
2	**Height of cycle track**		+50mm - +100mm	0-50mm / '100-150mm	150 above or <0mm	
3	**Location of cycle track**		Along the carriageway	Footpath separates cycle track from carriageway	Between property wall and service lane / combined with footpath/ any other location	
4	**Distance from carriageway**		>=0.75m up to <=1.2m	>0.3m up to <=0.75m / >1.2m - =3.0m	<=0.3m or >3.0m	
5	**Type of segregation/ buffer zone**		Green belt / utility belt	Green belt only	Kerb only / any vertical surface higher than 180mm / railing	
6	**Pavement surface**		Concrete/asphalt	Interlocking tiles / smooth tiles / stone	Unpaved / non-metal surface	
7	**Turning radius**		Mostly Smooth (30m or more)	Partly Smooth (10m-30m)	Rough (0-10m)	
8	**Barrier free (LHS/RHS)**		No obstructions	Some obstructions	Mostly obstructed	
9	**Slopes**		Comfortable (Does not require extra effort to cycle)	Moderate (Require more extra effort to cycle	Steep (Cannot be cycled)	
10	**Lighting levels**		Good lightning (tracks with avg. lighting level of 40lux)	Partial (tracks with avg. lighting level of40 to 22lux)	Poor (tracks with avg. lighting level of <22lux)	
11	**Traffic Calming at Minor Junctions (Speed breakers, raised crossing, rumble strips, etc.)**		Present at all T-junctions	Present at most T- Junctions	Absent at most T-Junctions	
12	**Cycle specific Marking**		Frequent and Visible	Sometimes	Rarely or hardly visible	
13	**Cycle specific**		Frequent	Sometimes	Rarely or hardly	

	Signage		and Visible		visible	
14	**Shade**		Complete	Mostly shaded	Lack of shade	
15	**Land use along the footpath**		Commercial (Retail) on both sides / Commercial (Retail) on one side and Residential or Commercial (Office) on the other side	Commercial (Retail) on one side and Vacant or Institutional land on the other / Both directions having Residential or Commercial (Offices)	Both sides vacant plot / Residential or Commercial Office on one side and Vacant/institutional land on other	
16	**Parking facility for cycles**		Within 250m of the station / bicycle are allowed in the transit	Provided between 250 - 500 m of the station	Informal parking available within 500 m of the station	
17	**Parking cost for cyclists**		Free	Less than MV parking fee	Same as motor vehicle parking fees	
18	**Effective width of footpath**		With No obstructions	With some obstructions	Mostly obstructed	
19	**Height of footpath**		75mm above cycle track	50mm above cycle track	>75mm above cycle track	
20	**Provision of footpath along segment**		Along full length of the segment	More than 80% of the length of the segment	Less than 80% of the length of the segment	
21	**Provision of service lane along segment**		Along full length of the segment and not opening onto the intersection	More than 80% of the length of the segment	Less than 80% of the length of the segment	
22	**Provision of on street parking along segment**		None	Less than 80% of the length of the segment	More than 80% of the length of the segment	
23	**Availability of at grade crossings**		Avg. spacing between controlled crossings is < 500m	Avg. spacing between controlled crossings is between 500 m – 700 m	Avg. distance of controlled crossings is >700 m	

24	**Type of additional crossings**		Level/ at grade crossing	Foot over bridges with elevators or half subways which are well lit.	Foot over bridges without elevators or completely covered subways without proper lighting	
25	**Time taken to cross road**		Staged with refuge island	Staged without refuge island	High Waiting Time	
	INTERSECTION					
26	**Tapering of cycle track at intersections (reducing width for cyclists to increase turning radius for MV's and it is not good for cyclist)**		No reduction in width at any intersection	Reduction in width at some intersections	Cycle track merged with turning vehicles at most intersections	
27	**Markings showing the continuity of cycle tracks at intersection**		Frequent and Visible	Sometimes	Rarely or hardly visible	
28	**Ramps to get off / on at intersections**		Frequent and Visible	Sometimes	Rarely or hardly visible	
29	**Provision of lighting at crossing**		Lit and enhanced visibility for motorised vehicles / Safe	Uncomfortable for crossing/ poorly lit	Unsafe and poorly lit	
30	**Cycle track termination up to stop line (any other should be considered absent)**		cycle track terminates at stop line leading to cycle box marking			

Appendix B: Intersection Design

Typical intersection based on the road functionality as given in CTTP



Improvement Plan for Khatla Junction and Access to New Capital Complex

Source: CTTP 2011

Appendix C: Sample Terms of Reference for preparing Detailed Project Report

I. Scope of work

The scope of work includes the following tasks that are further detailed out in later sections of this document.

Task 1 Establishing a Baseline of NMT in the City

Task 2 Study Area Analysis

Task 3 Visioning and Stakeholder Engagement – NMT Workshops

Task 4 Draft NMT Master Plan Recommendations

Task 5 Identify a Financing Strategy

Task 6 Identify a Phasing and Implementation Strategy

Task 1: Establishing a Baseline of NMT in the City

Task 1.1: prepare study area profile

Prepare a profile of the study area from available documents and compare with the city level statistics. The parameters include location in the city, history and evolution of the area, demographic data, socio-economic data and transportation network.

Task 1.2: Review of existing documents & studies

Compile and review of the previously completed and current planning efforts underway in the city with the intent to identify gaps and consistencies of the various policies, strategies and development projects when assessed against a backdrop of NMT Principles (Refer Guidance Document) under the following broad categories:

- Planning & regulatory context
- City-wide context
- Mobility & access
- Land use, public realm & urban design

Task 1.3: Undertake site visits(s) & prepareinventory of the planning & physical characteristics of the study area: The existing conditions inventory will include the preparation of a detailed base map and a series of inventory maps and photographs.

Task 1.4: Collect data, undertake documentation of the study area

The consultant is expected to document the land use, urban form, mobility network and street environment that determines / affects non-motorised travel within the city. These include but are not limited to:

- **Land use, urban form and activity:** Map the existing data using AutoCAD and GIS mapping procedures. Inventory will include the following at a minimum:
    - Existing land uses
    - Proposed land uses
    - Major nodes & activity centres
    - Major roads & infrastructure (Parking)
    - Existing natural features

  - Proposed key developments
- **Mobility networks:** The consultant will document different modes or combination of modes used by people for commuting i.e. walking, bicycling, intermediate public transport, public transport and private motor vehicles. This will be supported by the following documentation.
  - Mobility Networks
  - Road networks and safety
  - Non-motorised transport networks
  - Public transport
  - Intermediate public transport
- **Street environment:** The consultant will document the existing non-motorised infrastructure and environment. Physical characteristics of the streets in the city should be studied under the broad categories:
  - Existing right of way including: carriageway, lane widths, footpaths;
  - Street amenities including: signage, trees, street lights, vendors, public toilets;
  - Infrastructural elements: electric and telephone junction boxes, manholes, storm water drains;
  - Transit facilities such as: IPT stands, bus stops, parking.
- **Conduct vehicular, pedestrian and non-motorised vehicles (NMV) Counts:** Vehicular and pedestrian counts will be undertaken at major intersections to understand peak hour traffic and movement.

Task 1.5: Develop case studies and best practices in non-motorised transport initiatives
Select best practices that demonstrate successful NMT projects nationally and internationally. The case studies will highlight successes, failures and lessons learnt.

Task 1.6: Undertake focus group meetings & key interviews with stakeholders to help generate buy-in, identify major issues confronting the project, and the social, economic, and political goals for the project.

Task 2: Study Area Analysis

Task 2.1: Analysis, baseline conditions assessment and SWOT analysis: Undertake an analysis of baseline conditions and prepare issues and opportunities maps - utilise the existing conditions inventory to evaluate the physical characteristics of the study area.

Task 2.2 :Identify priority NMT zones: Prioritise the “pedestrian first” zones to define the nature of NMT initiatives based on the following parameters:

- Map existing land uses, proposed land uses and key developments to understand the distribution of residential, employment and institutional uses in the city.
- Identify activity generators: map housing, employment and recreational centres to determine the desired lines and identify routes of high NMV traffic.
- Delineate influence zone of existing or proposed transit to determine the area around transit routes or stations, where accessibility proposals needs to be prioritised

Task 2.3: Identify preliminary goals and targets with respect to the institutional support, plans, policies and development market.

Task 3: Visioning and Stakeholder Engagement – NMT Workshops

Invite and engage key stakeholders including elected officials and staff from various agencies to the visioning workshop, to achieve the following objectives:

- Discuss integration of NMT principles into the land use and transportation plans of the city
- Solicit implementation strategies from workshop participants
- Share and revalidate identifies NMT first goals and targets
- Prioritise goals into short term, midterm and long term opportunities
- Identify the market, generate project interest and solicit feedback

Task 4: Draft NMT Master Plan Recommendations

Task 4.1: Recommend modifications to existing NMT initiatives, suggest regulatory changes to integrate NMT principles, policy changes and catalyst/signature projects to trigger the desired intent of NMT plan within the city. Draft NMT Plan should include the following, at the least.

- Prepare an overlay of the desired NMT network, emphasizing the principles of continuity, interconnectivity, walkability, and universal accessibility. Recreation routes can also be identified as a part of the network planning exercise.
- Define a street hierarchy matrix, based on relevant IRC standards and existing conditions, including NMT allocations for each ROW.
- Define street characters based on their experiential and mobility functions, such as boulevard, esplanade, high street, pedestrian malls, NMT trails etc.
- Suggest typical designs that may be used for different types of streets, intersections and areas highlighting:
    - Physical interventions such as design of streetscapes, sidewalks, cycle tracks, or grade-separated facilities.
    - Wayfinding and signage interventions
    - Traffic engineering interventions such as creating car-free zones, temporary road blocks, road diets, or traffic signal improvements
    - Addressing sustainability features like rainwater harvesting, solar lighting etc.
    - Integrating with other modes – Metro and Bus stops, IPT stands and others
    - Parking design and integration of bicycle and cycle rickshaw parking
    - Integration of vending spaces and active public space interventions by design

Task 4.2: Identify pilot projects and signature projects
Based on the outcomes from task 3, develop priority projects that will impact the short term goals, ensures visibility and triggers the need for later stages based on the following (but not limited to) quantitative and qualitative parameters:

- Low budget and quick implementation is possible
- Small area of influence, which can be monitored to study impact
- Stakeholder opposition is not anticipated.
- Can generate debate on the benefits of investing in NMT infrastructure

Task 5: Identify a Financing Strategy

Task 5.1: Develop an understanding of the city's financing system impacting implementation of NMT related transportation projects like construction or maintenance of footpaths and cycle tracks.

Task 5.2: Develop a capital investment strategy for NMT projects- Develop a Capital Improvement Program, identifying budget amounts and sources to be diverted to NMT capital investments in the next 5-years.

Task 5.3: Identify innovative financing mechanisms and potential partners

- Develop incentives for private stakeholders to invest in NMT infrastructure
- Consider creating green financing options
- Evaluate opportunities to bundle NMT projects with other larger projects to make them financially attractive

Task 6: Identify a Phasing and Implementation Strategy

Task 6.1: Identify implementation and phasing strategy

Prepare a compendium of NMT proposals which includes preliminary recommendations with relevant priorities to enable the planning agency to systematically implement the recommendations.

Task 6.2: Technical capacity building recommendations

Assessment of existing capacity of the planning teams and to identify gaps and to recommend measures of augmentation of technical capacity. Also, define clear roles and responsibilities for NMT development and maintenance

Task 6.3: Develop monitoring and evaluation framework to measure success of NMT targets

Develop a post -project audit format to monitor that the project is beneficial in the short and long terms and the targeted beneficiaries.

Appendix D: Summary of Stakeholder Consultations

Stakeholder Workshop, 13th October 2014

The first workshop conducted in Aizawl City aimed at introducing NMT concept to various stakeholders of Aizawl city. Also, to build an enable framework amongst various players, which aims at building commitment and encouraging leadership to change culture and perceptions; integrating NMT with urban planning and decision making processes and budgets; and building capacities to enable effective implementation.

The workshop was conducted with the

- Principal Secretary of UD&PA (Aizawl) and his team
- Aizawl Municipal Council (AMC)
- Aizawl Development Authority (ADA)
- Aizawl Traffic Police
- Town and Country Planning Organization (TCPO)

The purpose of project and the city Specific Plan was explained through a presentation to the stakeholders of Aizawl. There was a clear consensus in the workshop about making the city cycle and pedestrian friendlier and comfortable. At the end of the workshop, all the departments and stakeholders readily co-operated in sharing the necessary data with the team.

Capacity Building Workshop (under JnNURM), 19th and 20th March 2015

A two day capacity building workshop was conducted, which was funded by the state government of Mizoram under JnNURM. This workshop aimed at strengthening urban management by providing various urban agencies technical assistance on various urban topics. Part of which focused on the topic of traffic and transportation of the city, hence discussing about NMT in the city. They key highlights related to NMT, discussed in the workshop with stakeholders are highlighted below.

The two day workshop involved members from the following departments and companies –

- UD&PA, Government of Mizoram
- Mizoram Pollution Control Board
- EMBARQ
- Mizoram Traffic Control Board
- Aizawl Municipal Council
- PWD
- TCPO
- PHED

Following are the key points related to NMT that were disseminated amongst the stakeholders based on the discussion and observation done in the workshop:

- Have a sound knowledge of transportation facility design, environmental impact mitigation, traffic flow analysis, traffic control, and transportation planning;
- Use of a multidisciplinary approach resolving transportation problems. This can be done either by engineers who are trained in all the related professions, or by working with professionals from different disciplines;
- Updating of knowledge on technology and management to adapt to new knowledge and innovations;
- Have a growing degree of interaction with other disciplines and problem areas through -
- Professionalization of “NMT”-knowledge and updating professional technical knowledge by learning new techniques along with mastering in traditional tasks of the engineer;

- Institutional integration so that the engineer grows out of a restrictive project approach and knows more about costs and community management.

Capacity Building workshop in Aizawl held on 20th March, 2015
Source: iTrans

Stakeholder Workshop, December 2015

The third stakeholder workshop, was conducted on 21st December of 2015. This workshop aimed at discussing the prepared NMT guidance document and NMT Aizawl City specific plan with stakeholders of Aizawl city. Also, to majorly acquire various suggestions and feedback of the prepared documents.

The stakeholders for the workshop represented from the government agencies of

- Aizawl Municipal Council (AMC)
- Ward Councilors of the city
- UD&PA
- Aizawl Traffic Police

The key takeaways of the workshop involved:

- One sided foot paths to be taken up in hilly areas, when the topography is not suitable for footpaths on both sides.
- Street Lights to be fixed to the installations (buildings, walls, hills etc.) across the street, as the streets of Hilly regions are narrow and clear space could be provided to pedestrians to walk on footpath.
- Lifts/Elevators and escalators as a smart proposal in the city.

Stakeholder consultation workshop held on December 2015.
Source: iTrans

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