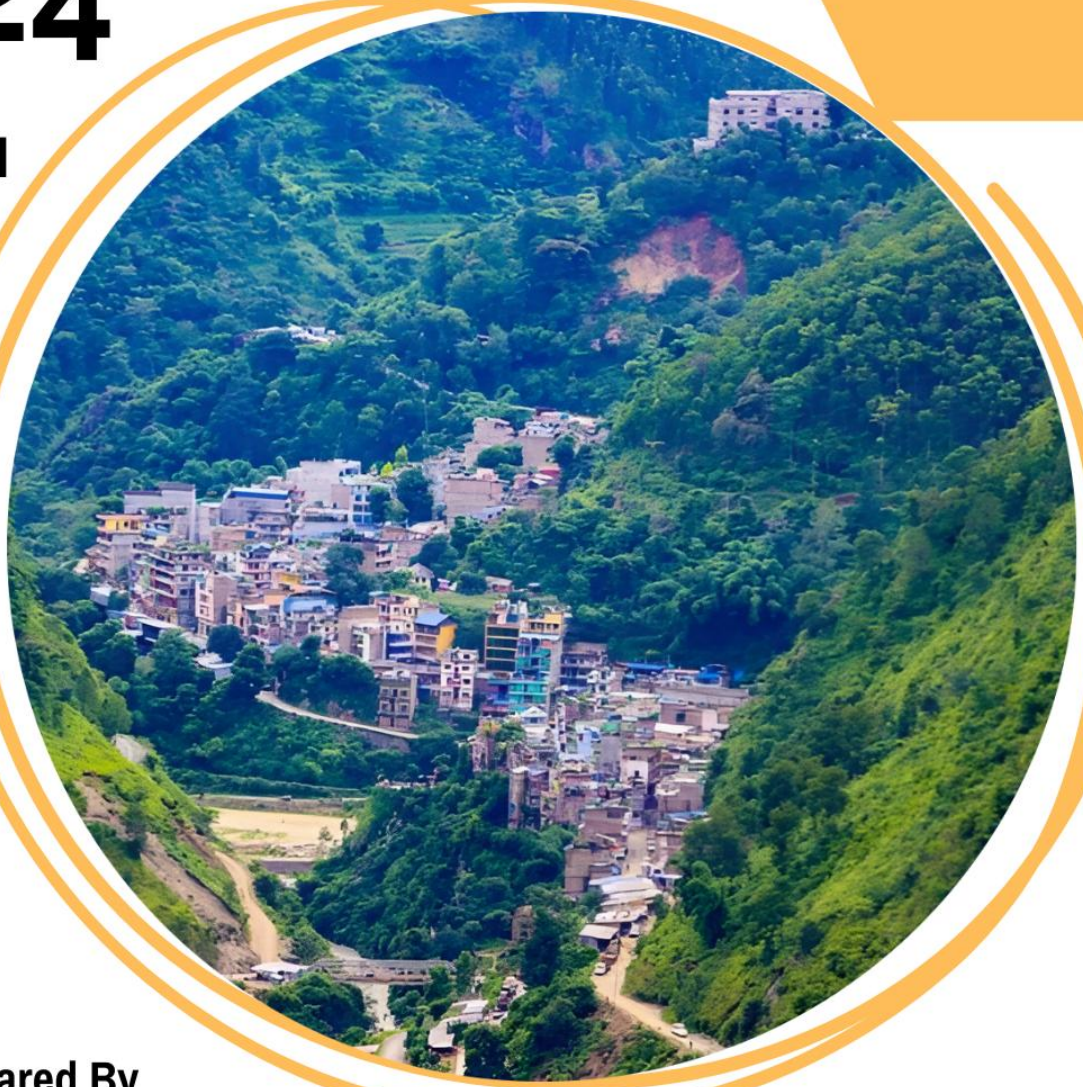
FINAL REPORT

Municipal Transport Master Plan (MTMP)

Sunilsmriti Rural Municipality

2024

Volume I



Prepared By
Geo Engineering & Management Services Pvt. Ltd.
Butwal, Rupandehi


सुनिलस्मृति
गाउँपालिका
सुलिचौर, रोल्पा

ACKNOWLEDGEMENT

We extend our heartfelt gratitude and appreciation to all those who contributed to the successful completion of the Municipal Transport Master Plan Report of Sunilsmriti Rural Municipality. This comprehensive document, which serves as a roadmap for the sustainable development of our transportation infrastructure, would not have been possible without the dedicated efforts of numerous individuals and groups.

First and foremost, we express our sincere thanks to Chairperson of Sunilsmriti Rural Municipality, Mr. Maniram Budhathoki, Vice Chairperson, Mrs. Mina Thapa and members of Municipal Executive Body, the elected representatives including the Ward Chairpersons, whose valuable insights and commitment to the betterment of our community have significantly enriched the content of this report. Their active participation in discussions and decision-making processes reflects a shared vision for a well-connected and accessible Sunilsmriti Rural Municipality.

We would like to thank with immense appreciation to the Chief Executive Officer of the Office of Municipal Executive, Mr. Gobinda Bhattarai and the technical section of Sunilsmriti Rural Municipality Er. Arjun Shrestha and Mr. Sudarshan Pun and all other staffs of Municipality Office and members of Office of Municipal Executive for the collective guidance and input which has laid a solid foundation for the forthcoming tasks. The officials of Sunilsmriti Rural Municipality, whose unwavering commitment and tireless dedication were instrumental in steering this project to fruition. Their leadership and guidance provided the necessary foundation for a collaborative and effective planning process.

The role of social mobilizers in engaging with the local community and ensuring that their voices were heard throughout the planning stages cannot be overstated. Their active participation in discussions and decision-making processes reflects a shared vision for a well-connected and accessible Sunilsmriti Rural Municipality. Their ability to bridge the gap between the municipality and the residents played a crucial role in fostering transparency and inclusivity in the development of the Master Plan.

Our appreciation also goes out to the diverse stakeholders who actively participated in consultations, providing invaluable perspectives and feedback. This collaborative approach, involving government agencies, non-governmental organizations, businesses, and other key players, ensures that the Master Plan is a holistic reflection of the community's needs and aspirations.

Last but not least, we extend our heartfelt thanks to the local people of Sunilsmriti Rural Municipality. Their patience, cooperation, and active engagement in the planning process have been indispensable. The success of this Master Plan is a testament to the collective spirit of our community and its commitment to shaping a sustainable and well-connected future.

In conclusion, the completion of the Municipal Transport Master Plan Report stands as a testament to the power of collaboration and shared vision. We express our deepest gratitude to all involved, confident that this document will serve as a catalyst for positive change and improved transportation infrastructure in Sunilsmriti Rural Municipality.

The Study Team.

EXECUTIVE SUMMARY

Transport facilities help in developing access with the rural-urban linkages. Road accessibility can reduce isolation, stimulate crop production and marketing activities, encourage public services and help to transfer technology. Road building has been seen to bring about notable enthusiasm and visible changes in rural life. Road infrastructure is considered as "the infrastructure for infrastructure". However, in the absence of notable criteria and rational guidelines, road construction is carried out in adverse manner resulting in haphazard use and wastage of limited resources. Municipal Transport Master Plan is prepared for assessing and planning the present road and transport infrastructures and facilities within the municipality and the surrounding local bodies.

Sunilsmriti Rural Municipality which is located in the Rolpa district, Lumbini Province of Nepal is a significant area in the western part of the country and also the gateway to Rolpa district. The municipality is divided into 8 wards. Geographically, it lies in the Hilly region, characterized by its low elevated hills. With an area spanning approximately 156.57 square kilometers, Sunilsmriti Rural Municipality holds strategic importance due to its location as a major trade and transit hub between Rolpa district and outer locations. The Rural Municipality is located between coordinate of 28° 22' 37.308" N to 28° 10' 39.9714" N latitude and 82° 36' 54.864" E to 82° 47' 57.1194" E longitude. The lowest elevation in the rural municipality is 660 m and the highest elevation is 2940 m above mean sea level.

This rural municipality shares its boundaries with several neighboring local bodies, including Rolpa Municipality and Runtigadhi Rural Municipality to the west, Sunchhahari and Lungri Rural Municipality to the East, Rolpa Municipality and Sunchhahari Rural Municipality to the North and Swargadwari and Pyuthan Municipality of Pyuthan District to the South. Its proximity to these neighboring regions fosters economic ties and cultural exchanges, contributing to the vibrant diversity of Sunilsmriti Rural.

The climate in Sunilsmriti Rural is temperate, typical of the Hilly region, characterized by mild summers and cold winters. The rural municipality experiences distinct seasons, with summer temperatures often soaring as high as 35 degrees Celsius and winter temperatures averaging minimum recorded as 3.6 degree Celsius. Monsoons bring heavy rainfall from June to September with annual mean rainfall of 1436.5 mm, which is vital for the region's agriculture.

According to the latest National Household Survey of 2021 conducted by Central Bureau of Statistics, Sunilsmriti Rural Municipality has a population of 30617 with 16522 (53.96%) female

and 14095 (46.04%) male and with 7009 households. Sex Ratio is 85.31 male per 100 female. The average household size is 4.37 and population density is 195.55 people per square km. The rural municipality is divided into 8 wards. Among them, the maximum nos. of population is in ward 8 with 4556 individuals & lowest in ward 6 with 2734 individuals. Ward 4 has maximum no of household whereas ward 5 has minimum households. Overall Literacy Rate of the Municipality is 74.5%. (Male 84.4% and Female 66.3%)

Sunilsmriti Rural Municipality consists of 7009 households with population 30617. Ward 4 has maximum household with 1085 and ward 5 has lowest household with 682. The average household size of Municipality is 4.37 people per household. Ward 7 has the maximum household size with 5.38 people per household and Ward 6 has lowest average household size with 3.76 people per household. Municipality has a population of 30617 among which 27359 are above five years old. Population above five years in age is accounted for literacy status of the Municipality. Among the 27359 people, 20382 people are literate. Thus the literacy rate of Municipality was found to be 74.5% while 25.5% of population (6977 individuals) is illiterate.

The total area of Sunilsmriti Rural Municipality is 156.57 sq. km. Out of the total area, the maximum land area is forest areas (85.83 sq. km.) followed by cultivation / built up area (47.04 sq. km). Similarly, bushes covers 15.33 sq. km. of land, Shrubs / grasses cover 5.48 sq. km., Rivers cover 0.64 sq. km., Ponds/ lakes cover 0.05 sq. km. and sands cover 2.27 sq. km. of land area.

Swargadwari Highway (NH53) is the only National Highway linking Sunilsmriti Rural Municipality with others part of the country. Similarly there are 7 district roads within the Rural Municipality which connects the Rural Municipality with neighboring local bodies and other districts. MTMP started with the setup of Municipal Road Coordination Committee (MRCC) and the collection of demand and inventory of road within the rural municipality. Road inventory survey was done and details of all the roads and cross structures were collected. The total length of all the roads inside the Municipal Boundary was found to be 417.71 km out of which 22.48 km is Strategic Road Network (National Highway), 73.57 km is District Roads while remaining 321.66 km are Municipal Roads. Among the municipal roads, 32.63 km is Class A road (ROW 12 m), 118.48 km are Class B roads (ROW 8 m) and 170.55 km are Class C roads (ROW 6 m). 0.58 km of roads are RCC, 23.67 km of roads in the rural municipality are Blacktop, 339.81 km are Earthen and approximately 53.65 km is to be newly constructed. Class wise, 22.48 km (5.38%) of total length is National Highway, 73.57 km (17.61%) is District Road, 32.63 km (7.81%) is Class A, 118.48 km (28.37%) is Class B and remaining 170.55 km (40.83%) is Class

F. Whereas surface wise, 23.67 km (5.67%) of total length is Blacktop, 0.58 km (0.14%) is RCC/PCC, 339.81 km (81.35%) is Earthen and remaining 53.65 km (12.84%) is new construction

Currently, the road density of various wards in terms of length per sq. km of land depicts ward 3, 7 and 1 to have higher values. These wards are densely populated ward of Sunilsmriti Rural and also have significant length of roads. In case of road density per 1000 population ward 1, 5, 2 and 7 have more road density.

The composition of vehicle shows that the major vehicle that plies on the roads of Sunilsmriti Rural Municipality is Motorcycle with 61% of total vehicle composition followed by Utility Vehicles and 4WD with 13% composition of whole traffic in Rural Municipality. Other than this, private Jeeps & Cars constitute 8%, Trucks constitute 6% and Motorized Three Wheelers constitute 3% of traffic volume. Similarly, Buses share around 5% and Tractors constitute 4% of traffic vehicle composition.

Vehicle Ownership of Municipality is based on the National Household Survey 2021. The ownership of vehicle shows that the major vehicle that the population of Sunilsmriti Rural Municipality own is Motorcycle with 195(2.78%) households. Cycles were owned by 20 (0.29%) households whereas 34(0.49%) households had an ownership of Cars/Jeep/Van and 11 (0.16%) households possess other vehicle type and 6749 (96.29%) households did not have any type of vehicle as mentioned in National Household Survey data. Population density by buildable land data shows that presently wards 3, 6, 8 and 1 do have higher density while ward 5, 7 and 2 have lower population density per hectare of buildable land. Ward 6 has the highest with 85.75 people living per hectare of settleable land while lowest in ward 5 with 7.09 people. The road density based upon buildable land shows that ward 5 has the lowest road infrastructure developed with 2.30 km per sq. km of settlable land while highest in ward 3 with 31.99 km per sq km of settlable land. The overall accessibility situation to public vehicles in Sunilsmriti Rural Municipality can be termed as poor. The data collected from origin and destination survey in various wards found out that an average person had to travel 25 minutes to board public vehicle. The population of ward 4 has relatively easy access to public transportation service with 15 minutes while ward 5 suffers the most with 40 minutes on average. Availability of dedicated public vehicle routes will further aid in boarding time Average travel time taken to travel to destination follows dissimilar trend to time to bus park. More or less people travel 25 minutes to get to their destination in other wards. In the past couple of years, availability of three wheeled auto rickshaw and jeeps has made the life and travel of the residents fairly easy reducing the time

to board vehicle. The origin and destination survey showed that a majority of trips made are by walking on foot with 66% followed by motorcycles with 28%. 5% of trips were generated through public vehicles including buses, jeeps and three wheeled auto rickshaws. Similarly only 1% of trip were generated by private four wheeled vehicles. The sample household survey shows that nearly 81% of the daily trips are done via active mode of transport. In the rural municipality we find that the active mode of transportation is more extensively used (81%) than passive mode (19%). Mobility relies on the privately owned vehicles, small public vehicles or walking. Due to the introduction of small public transport vehicles and services, a ground level public transportation system has been established. However not everyone can afford it on a daily basis. With only 5% of trips utilizing public vehicles, public transportation options such as shared jeeps or small buses are limited. The average growth rate of population in this rural municipality is on average 8.52% which indicates urbanization. Based on this trend, the average projected population of this municipality on the year 2031 will be 33226. While the access situation in Rural Municipality is satisfactory, mobility is a problem in present traffic situation which is being tackled effectively in recent years.

Visionary city development and Indicative Development Potential Plan is prepared basically showing the existing and potential market center/service centers (key growth centers) and the areas having various development potentials such as agro-based industries, high value cash crops and industries.

This study also formulated the road hierarchy for the various roads namely Class A, B and C. Class C basically deals with access while Class A and B basically deal with mobility and accessibility to higher services. The total cost for the required interventions proposed for all the municipal roads and to upgrade all of them (MTPP Cost) is calculated based on the rates of ToR and was found to be approximately NRs. 5,209,459,656 (Five Billion Two Hundred Nine Million Four Hundred Fifty Nine Thousand Six hundred and Fifty Six only). For the allocation of yearly budget, the total cost required for five years is first calculated and this amount is distributed to yearly assuming that budget spending capacity of municipality is expected to grow at the rate of 10% per year. Total budget allocated for the 5 years (MTMP budget) was found to be approximately **NRs. 119,134,921 (One Hundred Nineteen Million One Hundred Thirty Four Thousand Nine Hundred and Twenty One rupees)**. During this span of five years, 3.87 km roads will be blacktopped which will include Class A roads.

Due to the limitation of the municipality budget, the roads are ranked hierarchy wise based on the Demand priority of wards, Proposed road class, Total existing width, Population served,

Road surface condition, Road density, Settlement density, Service provided by the road such as Recreational(R), Agricultural (A), Market(M) and Service centre(S) (RAMS), Access to poor and minor. And five year implementation plan is prepared.

ACRONYMS / ABBREVIATIONS

CBS	Central Bureau of Statistics
DTMP	District Transport Master Plan
GIS	Geographic Information System
GPS	Global Positioning System
IDPM	Indicative Development Potential Map
MIM	Municipality Road Inventory Map
MRCC	Municipality Road Coordination Committee
NMT	Non- Motorized Transport
MTMP	Municipality Transport Master Plan
MTPP	Municipality Transport Perspective Plan
PCU	Passenger Car Unit
DOLIDAR	Department of Local Infrastructure Development and Agricultural Roads
GPS	Global Positioning System
OD	Origin and Destination
ToR	Terms of Reference
SRN	Strategic Road Network
HH	Household
VDCs	Village Development Committees
PT	Public Transport
Min.	Minute
Km.	Kilometre
RM	Rural Municipality
Sq. Km	Square Kilometre
Ha	Hectare
DCC	District Coordination Committee

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF CHARTS

CHAPTER 1: INTRODUCTION

This chapter briefly explains the background for preparation of transportation master plan, objectives of study, scope of work to be performed for preparation of transportation master plan and limitations of the study thereof.

1.1 BACKGROUND

Rapid urbanization has led formation of rural areas to urban areas in short time. The presence of goods, services and facilities attracts people from rural areas to live in urban areas. While in past policy were made to encourage people to reside on their native area due to haphazard urbanization, recent study from economics and market theories support dense population over urban areas based upon agglomeration and scale economies. Agglomeration economies are amplified by density and attenuated by distance. While in rural areas accessibility has been focused as major criteria in transportation, urban areas need better mobility with accessibility.

Transport facilities help in developing access with the rural-urban linkages. Road accessibility can reduce isolation, stimulate crop production and marketing activities, encourage public services and help to transfer technology. Road building has been seen to bring about notable enthusiasm and visible changes in rural life. Road infrastructure is considered as "**the infrastructure of infrastructures**". However, in the absence of notable criteria and rational guidelines, road construction is carried out in adverse manner resulting in haphazard use and wastage of limited resources.

After being designated as a municipal area, this rural municipality has attracted more population as socio-economic growth and other infrastructure development has gained pace. The municipality and its surrounding local bodies have seen a rapid increase in housing, infrastructure and urban services demand. In this regard, under the coordination of Municipal Assembly and as per the decision of Municipal Executive Committee and its technical and Institutional support, is initiating the formulation of Municipal Transport Master Plan for assessing the present road and transport infrastructures and facilities within the municipality. So as to be presented as proper municipality or a city, it must have a very good mobility and accessibility by public and private means of transportation.

Municipal Transport Master Plan is a reflection of transport infrastructure situation and future need in relation with the resources of the Rural Municipality. MTMP has been prepared basically adopting active participation for consensus building among all actors of the society. It strongly advocates for meaningful participation in the planning process to make MTMP more acceptable

and creating ownership. The preparation process of MTMP has pursued series of techno-political interface in the form of consultation workshops and interacting meetings to increase participation of all stakeholders such as Municipal level workshop, meetings and Ward Committee's representatives, formal/informal meeting and interaction, focus group discussions and transit walk, etc. In every stage, emphasis has been given on their access and high level of participation of different actors of society (i.e. representatives from major political parties, social leaders, women organizations, Dalit and Janjati coordination committee, differently able people, chamber of commerce, transportation association) and work toward consensus building. The normal period of MTMP is for five years. The given time frame will be strictly followed by the municipality in order to achieve its targeted plan on time.

Municipal Inventory Map of Road Networks has been prepared using the GPS data (tracking of alignment and way points of all existing or potentially required major road structures and trail bridges). Transport Infrastructure Network has been overlaid on the IDPM. Accessibility map has been prepared using GIS model to locate the inaccessible areas where the development interventions are required. New network has been planned in the inaccessible area based on the national transport policy.

1.2 OBJECTIVE OF THE STUDY

The overall objective of the consulting services is to prepare the Municipal Transport Master Plan (MTMP) / Municipal Transport Perspective Plan (MTPP) of Sunilsmriti Rural Municipality of Rolpa District as indicated in the ToR.

The MTMP is designed to take account of the real needs of the people for infrastructure as per the Comprehensive Development Plan. Until this Comprehensive Development Plan is prepared, the rural municipality will prepare intermediate visionary plan. Based on this visionary plan MTMP is prepared so as to harmonize with DoLIDAR's Approach manual to maintain similarity so that municipal transport network can be overlaid to the respective DTMP/other MTMPs to prepare local transport network.

The specific objectives but not necessarily limited to the following, are:

- Prepare visionary model of development plan
- Analyze the accessibility situation.
- Identify and priorities the interventions based on the accessibility situation.
- Prepare Indicative Developmental Potential Map (IDPM)
- Prepare the Municipal Inventory Map (MIM) of Road networks.

- Collection of demands for new/rehabilitation transport linkages from Municipalities/Settlements based on city development plan.
- Prepare the Perspective Plan of transport services and facilities;
- Synchronize the draft Perspective Plans of adjoining Municipalities/ districts
- Develop scoring criteria and its approval from Municipality.
- Prepare the five year Municipal Transport Master Plan (MTMP)
- Prepare a realistic physical and financial implementation plan of prioritized roads for the MTMP period; and
- Prepare Municipal Transport Perspective Plan (MTPP)

1.3 SCOPE OF WORK

Consultant has provided high quality professional services for the preparation of MTMP / MTPP & visionary development plan. The scope of services carried out by the Consultant has broadly included, but not limited to the followings.

- Assist in Formulation of Municipal Roads Coordination Committee (MRCC)
- Assist in the Collection of Secondary Sources of Information
- Review of the existing MTMP
- Assist in the Collection of Accessibility Data Collection and Analysis
- Assist in the Preparation of the Indicative Municipal Development Potential Map (IDPM)
- Assist in the Preparation of the Municipal Inventory Map (MIM) of Urban Road, Main Trails and Bridges
- Assist in the Collection of Demands for New/Upgrading/Rehabilitation Transport Linkages from Wards/Settlements
- Assist in Developing Scoring Criteria and its Approval from Rural Municipality/IDD
- Assist in Road classification and nomenclature
- Assist in Preparation of Perspective Plan of Interventions of Services and Facilities
- Assist in Analyse Fund Availability for Roads
- Assist in Preparation of the Municipal Transport Master Plan (MTMP)
- Assist in Preparation of a Realistic Physical and Financial Implementation Plan of Prioritized Roads for the MTMP Period

The scope of this work and service the consultant provided for the project is given below:

a. Accessibility data Collection and Analysis.

The accessibility situation is evaluated from the settlement level and data is collected. Various surveys carried out to gain such data including their travel patterns, questionnaire surveys and origin-destination survey.

b. Analyze Mobility status of the rural municipality

Mobility status is studied. This is important especially because the road network has not provided accessibility to all the population. The question then arises on how efficiently; economically and safely can the goods and passengers be transported, which is indicated by mobility.

c. Assess the condition of public transportation

Data on different public transportation routes and their operation characteristics, which operate within the municipal area and to other adjoining area, is collected and studied.

d. Assess safety status and issues

Road safety status and issues is accessed. For this, roadside condition survey during road inventory survey and other accident data is reviewed. Possible interventions to make the roads safer are proposed and recommended.

e. Prepare the Indicative Municipal Development Potential Map (IDPM)

IDPM is prepared using topographical base maps and digitized GIS maps. In the IDPM, potential areas for development are identified and prioritized through ranking.

f. Prepare Municipal Inventory Map (MIM) of existing roads within Sunilsmriti Rural Municipality.

Municipal Inventory Map linking to strategic road networks such as national highways, district core road network, main trails is prepared. The inventory map has included the road names, total length and breadth of the roads, surface type, existing condition, Right of way, vehicular traffic and pedestrian traffic flow etc.

g. Collection of demands for New/Upgrading/Rehabilitation transport Linkages from Wards/Settlements

Data regarding the construction, maintenance or rehabilitation of roads according to the existing condition and demand is done. Such data was collected through ward meeting or community level discussion. The demand data was collected in priority order for each ward. The roadside conditions of all the linkages were noted during the road inventory survey.

h. Scoring criteria

Scoring criteria to screen and prioritize all interventions potential interventions for proper allocation of limited budget is developed and approved by the rural municipality.

i. Road classification and Nomenclature

Metric system of nomenclature is used and applied the same classification throughout the data collection.

j. Preparation of perspective plan of interventions of services and facilities.

The data collected through accessibility survey, demand survey and inventory maps are used to prepare a perspective plan of interventions of services and facilities. All the identified interventions are screened and rated on the basis of approved criteria and forwarded to Rural Municipality council meetings. The final perspective plan has been shown in GIS maps.

k. Prepare a realistic physical and Financial Implementation Plan of Prioritized Roads for the MTMP period

Resources required for the implementation of the MTMP is assessed and the financial plan (required) for the next five years is prepared.

l. Prepare Municipal Transport Master Plan (MTMP) of Sunilsmriti Rural Municipality.

Municipal Transport Master Plan (MTMP) is prepared with due consideration to the existing situation of: vehicular parking, travel routes, modes of transport, etc. and purpose for future urban growth. A base scenario of the existing road and transport network and management based on the O-D survey and O-D matrix, and prepare road inventory map and transport infrastructure network and management plan based on the travel demand forecast, population growth forecast, and growth rate of vehicular and transport infrastructure is prepared.

m. Medium term and long term planning

The scope of work demands a detailed work plan for five years period (short term). Forecast/estimate of the demand for medium term (10 years) and long term (20 years) is done and recommended a framework to guide future interventions and planning processes.

1.4 LIMITATIONS

MTMP is prepared to be a valid legal document approved by Rural Municipality. In order to implement the plan, Rural Municipality should consistently own the document and use the investment plan.

Socio-economic data to be used in the MTMP preparation are collected from primary & secondary sources of information. Prioritization criteria are presented in Municipality for their approval. Perspective plan and five year MTMP plans is prepared based on the results of prioritization process following the MTMP guide lines. They reflect information on Municipal's financial resources as to be made available by the municipality to the study team.

Cost Estimate of Road Construction is prepared based on the experience gained from the past implementing road works of similar terrain/nature. The estimated resource envelop for the implementation of road projects is prepared after analyzing the past trend of budgets. Therefore, the budgetary figures projected are only an indicative. There may be unforeseen changes in the level of actual allocation of budgets for the road sector.

Creating a Municipal Transport Master Plan is a complex task that involves various considerations and challenges. Some of the limitations or challenges that may arise in the process of developing such a plan include:

Data Availability and Accuracy: One significant limitation is the availability and accuracy of data. Insufficient or outdated data regarding population demographics, traffic patterns, infrastructure, and commuting habits can hinder the accuracy of the plan.

Financial Constraints: Implementation of a comprehensive transport master plan often requires substantial financial resources. Limited budgets or funding constraints might restrict the scope or execution of proposed initiatives and infrastructure development.

Changing Demographics and Urban Dynamics: Urban areas, including municipalities, experience dynamic changes in population density, migration patterns, and economic activities. These changes can challenge the long-term relevance and adaptability of the transport plan.

Stakeholder Engagement and Coordination: Engaging various stakeholders, including local communities, businesses, transport operators, and government agencies, is crucial. However, conflicting interests and coordination among different stakeholders can complicate decision-making and implementation.

Technological Advancements: Rapid advancements in technology, such as electric vehicles, autonomous transportation, and ride-sharing platforms, can significantly impact transportation

systems. Integrating these emerging technologies into a long-term plan requires flexibility and adaptability.

Environmental and Social Impacts: Transport infrastructure development can have environmental and social impacts. Balancing the need for improved transportation with minimizing negative effects on the environment, heritage sites, and local communities is a challenge.

Regulatory and Legal Challenges: Compliance with existing regulations, zoning laws, and legal frameworks can pose hurdles in executing certain aspects of the transport plan, especially when they require changes in infrastructure or land use.

Unforeseen Events and External Factors: Natural disasters, economic shifts, or unexpected events like pandemics can disrupt transportation systems and affect the implementation and sustainability of the master plan.

Addressing these limitations requires a holistic approach that considers flexibility, adaptability, continuous monitoring, and stakeholder engagement throughout the planning and implementation stages. Strategies to mitigate these limitations include regular updates to the plan, fostering partnerships with stakeholders, leveraging technology, and conducting comprehensive feasibility studies.

1.5 ORGANIZATION OF REPORT

Section 1 presents the concept and context of MTMP and lists out the objectives and scope of the same.

Section 2 briefly explains the method used to conduct the study, analyze the data and presentation of the findings.

Section 3 presents the basic profile of the study area through the available census data and sample data collected and the existing scenario of the study municipality with reference to transport in the municipality.

Section 4 gives the comprehensive forecast of the population, transport and other development scenario. It also gives the picture of the implications that may arise and the transport infrastructure to meet the demand and accelerate the development. It also describes the short term, medium term and long term plan.

Section 5 describes the formulation of road hierarchy and name and description of different classes of roads

Section 6 is dedicated to the five year (short term) municipality transport master plan (MTMP). It gives the comprehensive strategic framework, perspective plan of the municipal roads, budget expenditure, financial institution, capital investment plan and the staging implementation plan.

Section 7 summarizes the report and gives necessary recommendations.

CHAPTER 2: STUDY METHOD

Municipal roads are supposed to provide both access and mobility to all possible and potential areas. MTMP will helps to assist the planning of such roads to fulfill the stated objective. Better planning is incomplete without relevant quality data and quality data can only be acquired by use of properly selected survey methods. The chapter deals with the methodological framework adopted for data collection covering all used survey method, sampling techniques, quality and quantity of data along with data processing, analysis and presentation methods.

2.1 LITERATURE

The major source of information and literature for the preparation of Municipal Transport Master Plan as identified by the consultant are the previous MTMP of Sunilsmriti Rural Municipality, DoLIDAR, DoR, Department of Survey, Rural Municipality, local level line agencies and the local people. INGOs and NGOs working in the Rural Municipality are also identified as reliable source of information.

Creating a Municipal Transport Master Plan involves referencing a variety of literature and sources to ensure a comprehensive and well-informed report. Here are potential sources of literature for developing a Transport Master Plan specific to Sunilsmriti Rural Municipality, Nepal:

Previous MTMP: Municipal Transport Master Plan have already been not been carried out previously in Sunilsmriti Rural Municipality. This is the first edition of Municipal Transport Master Plan of the Rural Municipality.

Government Publications and Policies: Accessing official documents from the rural municipality, regional development authorities, and national government bodies related to transportation, planning, and infrastructure development is essential. These might include development plans, transportation policies, and regulatory frameworks such as Ministry of Urban Development (MoUD), Department of Urban Development and Building Construction (DUDBC), Department of Roads (DoR), Local Level Development Authorities and Development Committees, Ministry of Physical Infrastructure and Transport (MoPIT) and By Laws of different Local Government Bodies.

Census and Demographic Data: Utilize census reports, demographic surveys, and data from relevant government agencies to understand population trends, commuting patterns, and transportation needs specific to Sunilsmriti Rural Municipality. Data from Central Bureau of Statistics were taken into consideration which includes the latest household survey of 2021.

Academic Research: Exploration of scholarly articles, research papers, and studies conducted by universities or research institutions focusing on transportation, urban planning, and infrastructure development in Nepal or similar regions.

Transportation Studies and Reports: Accessing existing transportation studies, reports, and assessments conducted within Sunilsmriti Rural or neighboring areas. These might cover traffic flow, road conditions, public transportation usage, and infrastructure needs.

Local Stakeholder Engagement: Engagement with local stakeholders such as community groups, transportation associations, business forums, and residents to gather firsthand insights, concerns, and suggestions regarding transportation challenges and needs.

Case Studies and Best Practices: Exploration of case studies from other municipalities or cities that have successfully implemented transport master plans. Identifying best practices and lessons learned that could be applicable to Sunilsmriti Rural Municipality.

Urban Planning Guidelines: Referring to planning guidelines and principles advocated by international organizations like the United Nations or the World Bank. These can provide valuable frameworks for sustainable urban transportation planning. These guidelines include National Urban Development Strategy (NUDS), National Urban Development Plan (NUDP), National Strategy for Local Governance and Decentralization (NSLGD), Urban Planning Act, Land Use Planning Guidelines, Sustainable Development Goals (SDGs), Disaster Risk Management Guidelines, Heritage Conservation and Urban Design Guidelines and Transportation and Mobility Guidelines

Environmental Impact Assessments: Considering environmental impact assessments and studies that evaluate the potential environmental effects of transportation infrastructure projects. This information can help in planning sustainable and eco-friendly transport solutions.

Consultancy Reports: Reports prepared by consultancy firms specializing in planning, transportation, and infrastructure development can offer professional insights and recommendations tailored to the rural municipality's needs.

Local Knowledge and Expertise: Leverage of the knowledge and expertise of local planners, engineers, transportation experts, and stakeholders familiar with the specific challenges and opportunities within Sunilsmriti Rural Municipality.

A comprehensive Transport Master Plan for Sunilsmriti Rural will likely involve synthesizing information from multiple sources to create a well-rounded and contextually relevant report that addresses the municipality's unique transportation requirements.

The Consultant in the beginning has collected relevant reports and maps and information from the central level government, provincial government and non-government agencies to streamline the study. The consultant has then carefully/critically reviewed the collected information to enrich its knowledge in the transport sector development in nation at large and in the municipality through MTMP / MTPP in particular. The relevant government policy, Act and regulations are also studied. The following reports have been collected and reviewed.

- MTMP of surrounding local bodies.
- DTMP of Rolpa District
- 15th National Periodic Plan (FY 2019/20 to FY 2023/24)
- National Strategy for Local Infrastructure Development,
- Transportation Policy (2020), National Transport Policy (2043) and Transport Management Act, 2049 (1993)
- Local Government Operation Act (LGOA)
- Town Development Act, 1988
- Environmental Protection Act, 1997
- Guideline for Land Use Planning, 2073
- National Strategy for Disaster Risk Management (NSDRM)
- Fiscal Year 2022/2023 Budget
- Approach for the Development of Agricultural Road, DoLIDAR
- Database of different wards of Sunilsmriti Rural Municipality.
- Sunilsmriti Rural Municipality Profile
- Recently made DTMP/MTMP of different districts/municipalities/rural municipalities.
- Topographical map of rural municipality can be used as base map.
- Administrative Maps
- Zonal Maps
- Service Maps of Hinterland Municipalities
- Also studied the documents such as "Nepal Agriculture Perspective Plan, APP (1997-2017), Poverty Reduction Strategy Paper 2001, Local Self Government Act 1999 and Regulations 2000, and National Strategy for Rural Infrastructure Development 1997 as a reference.

In addition to this, the consultant is in the process of collecting the following documents either at Central Level or will be collected them from the Rural Municipality during the time of field

investigation so that the findings of the studies could be incorporated into the targeted MTMP/MTPP reports in more details.

- MTMP/MTPP of neighboring rural municipality/municipality (if available).
- Updated Data for Municipal Profile.
- Annual plan, Programme and Budgetary Allocations in last 5 years of Rural Municipality.
- Expenditure in infrastructure development including roads in last 5 years
- Data on ongoing rural road projects in the rural municipality, districts and schedule including bilateral and multilateral funded projects.
- Arial photographs
- Trail Map etc.

2.2 APPROACH

The Municipal Roads Coordination Committee (MRCC) plays a crucial role in the formulation of the Municipal Transport Master Plan (MTMP) by adopting a participatory bottom-up approach that ensures inclusivity, efficiency, and sustainability and differs from conventional practices of trickle down approach. Techno-Political interface has been incorporated in the planning process, where active participation from representatives of political parties, line agencies, municipality officials is crucial. The Municipal Road Coordination Committee (MRCC) has been constituted as authorized legislative body of rural municipality. This body, comprising all stakeholders, representatives and concerned technical officials, helps in necessary policy decisions during the MTMP preparation and implementation process.

2.3 METHODOLOGICAL FRAMEWORK

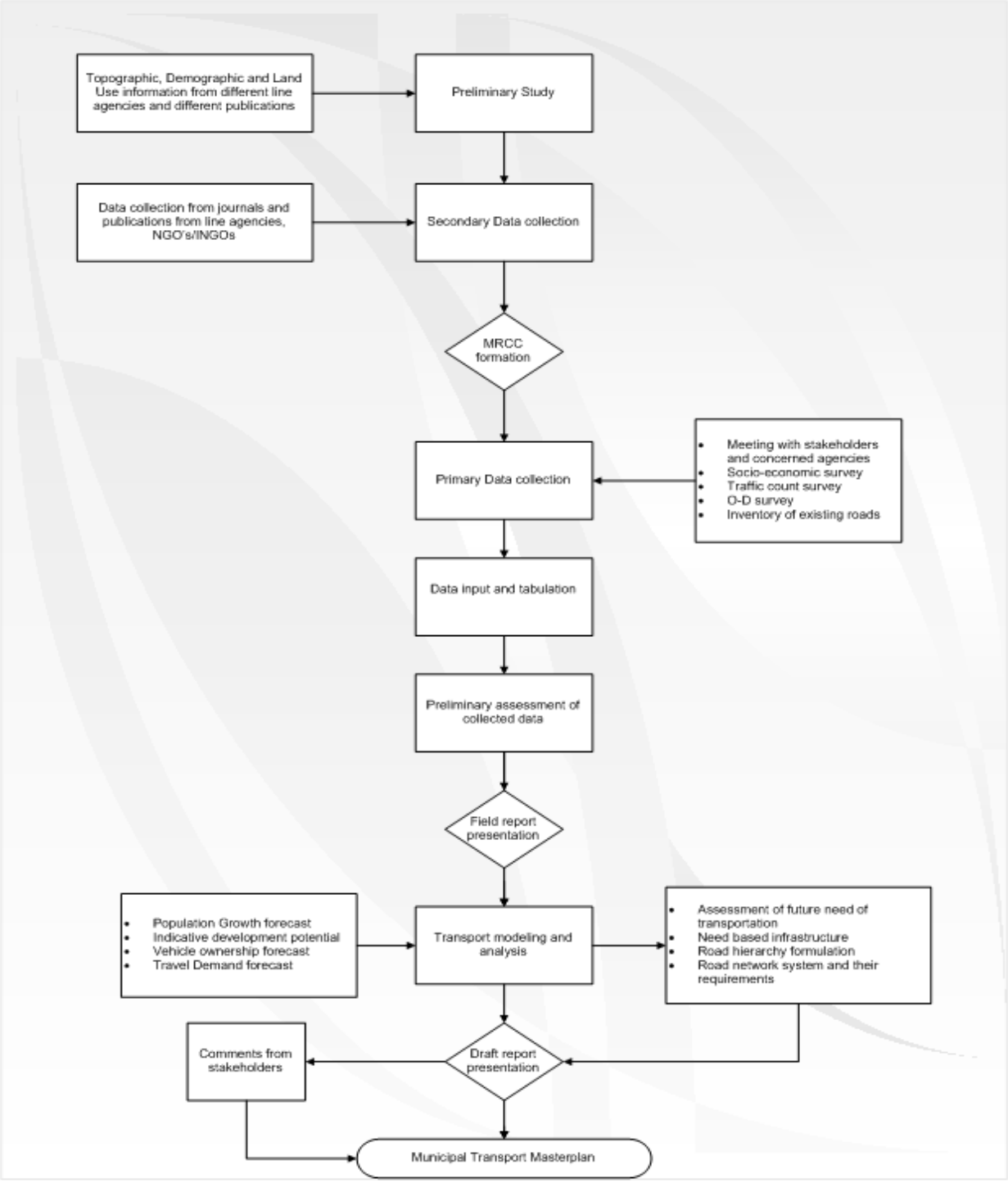


Figure 1: Methodological Framework

The study started with preliminary planning or desk study where basic background of rural municipality is studied with help of secondary data including census data, GIS data. The study got acceleration with formation of MRCC and inspection report. Various field surveys have been carried out with objective of collecting primary data on transportation network, trip characteristics and service facilities. Along with the primary data, demands for various transportation projects (construction / upgrading / maintenance) have been obtained from each

ward. Also, potential areas/location for various facilities have also identified based on interaction with local people and MRCC.

The scoring criteria for prioritizing road network has been identified based on ToR and has approved by rural municipality. Then, the hierarchy of road has been purposed and perspective plan of various interventions has been purposed and has been analyzed based on available fund and finally physical and financial implementation plan of prioritized roads for MTMP period. After analysis, the study has been come up with potential roads, that need immediate intervention and roads that need to be given consideration for effective future planning.

All the above mentioned strategy adopted for data collection, processing and analysis is summarized in *Figure 1* above.

2.4 SECONDARY DATA COLLECTION

Any sorts of data that are collected from secondary sources are called secondary data. These data has been collected from annual report published by district level offices and consultation with various concerned stakeholders. Municipal Road Coordination Committee (MRCC), which compromises people from various fields and political parties, is the next source for various secondary data. Field study was also carried out for general socio-economic assessment of the municipality that includes collection of data regarding high development potential areas such as extensive agriculture, horticulture, livestock farming, high value cash crops, cottage and agro-based industries, centre for business/commerce/markets places, information about demographic data of municipality, various maps showing service centers, transport infrastructure inventory, past plans and sector study reports, sector standards and policy targets were collected from the secondary sources, which includes Bureau of Statistics, Survey Department, Local NGOs, line agencies, DCC, rural municipality etc. Digitized topographic maps, administrative map of rural municipality, strategic road network map prepared by DoR, etc. were some other secondary data that were used during the study.

2.5 PRIMARY DATA COLLECTION

Primary information on present household and trip characteristics, traffic characteristics, existing accessibility and mobility level of settlements, prioritized road network required for each wards has been obtained via various reliable methods. Tracking of the existing road network along with detail information of its width, surface type and possible intervention required for the effectiveness of services is also carried out.

The primary data collection methods carried out in the field were:

- Origin and Destination (OD) Survey
- Road Inventory Survey
- Demand Survey
- Classified Vehicle Count Survey
- Public Transport and Services Study

Origin and Destination (OD) Survey Household questionnaire method is used to conduct OD survey which gave number of information reflecting, personal, household and trip making characteristics. This survey has also helped to visualize the accessibility and mobility scenario of road network and to public transportation from the settlement/wards. As all the household can't be covered a realistic and statistically significant sample size was calculated based on probabilistic method.

Road inventory survey was conducted to collect data on its condition of road, road linkage, road safety status and issues that need to be highlight. It helped in field validation of base maps and also assisted in the preparation of road inventory map, nomenclature and coding of the road linkages and proposed various interventions.

Road Demand survey comprised of interaction session with the members of ward committee followed by ward level workshop to fill up demand survey form, which included demand of new facility or interventions to improve existing roads based on priority.

Classified vehicle count was conducted so as to reflect the usage of various vehicles in the certain route, especially where maximum volume occurs. Twelve hour count has been done at required location and the vehicles have been classified to different types and finally traffic volume have been converted to passenger car unit (PCU) to visualize the exact condition.

Public Transport and Services Study highlighted the services provided by public transportation and location of various services and facilities. It was carried out by directly interviewing the route operators.

2.6 DATA PROCESSING AND ANALYSIS

Data collected at field were first entered at MS office tools (MS excel and word) and GIS database. All the complete and reliable sets of data were transformed into useable information and the present scenario of rural municipality are shown through graphs, figures and tables. Similarly, those which were entered into GIS database provide various types of maps. Population and traffic were forecasted for the MTMP and MTPP time period. Various transportation models

were used for interpretation and forecasting. And, finally various intervention were purposed and their economic analysis were also performed.

2.7 PREPARATION OF INDICATIVE POTENTIAL DEVELOPMENT MAP (IDPM)

IDPM is basically the indication of the existing and potential market/service centers (key growth centers) and the areas having various development potentials such as high value cash crops, agro-based industries and tourism. Thus, IDPM shows the areas of high value cash crops, tourism potential, extensive agriculture, extensive horticulture, livestock farming, fisheries, hydropower location and the other social service centers areas such as hospital, post office, telecommunication, school, campus, Municipal centers, security offices and large settlements, important historic and religious places. Finally, it has indicated the grading of various markets of the district thus providing the basis of network planning.

2.8 SCORING CRITERIA FOR PRIORITIZATION

A network consists of several links. It is not possible to construct all roads at a time due to resource and time constraint. Therefore, each link in a network needs to be prioritized. After developing a municipal level network, the cost estimate of the road has been prepared. Existing population within the zone of influence, priority of road demand, road class, width of road, road density, density of settlement, type of service provided by the road and the service to minority were taken as the indicators for prioritization. The scoring criteria has been finalized after rigorous study and set in front of rural municipality and MRCC for its approval. Scoring criteria has been discussed detail and appended in Volume II of the report.

2.9 PRESENTATION OF RESULTS

The results obtained can only be perceived well by the readers if presented properly. Presentation tools such as charts, graphs, maps and reports have been used to present the analysis and results obtained. The specific presentations of results are summarized below:

- Reports: The analyzed results have been properly explained in the reports. Report of the analysis has been presented at different levels as inception report, field report, draft report and final report. Any questions raised or clarifications demanded after the submission of draft report have been included in the final report.
- Charts and graphs: Relevant type of charts, tables and graphs have been used in the reports to present the information. Charts are especially useful to deliver the information more effectively.

- Maps: As the ToR demands, maps of road inventory, indicative development potential map, land use map and municipality transport prospective plan map has been prepared.
- In addition to the reports, the obtained results have been shared via presentation and electronic copy of GIS maps.

The analyzed data and obtained results in the form of numbers/ tables and maps have been collected in and presented as final report in two volumes. The results have been presented and discussed among the municipality authorities and other stakeholders before preparing the final report.

CHAPTER 3: STUDY AREA PROFILE

The method of data collection described in chapter two was adopted in Sunilsmriti Rural Municipality. Traffic count has been conducted at various places of Sunilsmriti Rural. Household data is collected from different wards. Based on the collected data, study area profile has been mapped.

3.1 LOCATION (PUT ON STUDY AREA)

Nepal is a small landlocked South Asian country of 1,47,516 square kilometers located in between China and Himalayan ranges in the north and India in the south. This multi-dimensional heritage encompasses the diversities of Nepal's ethnic, tribal, and social groups, and it manifests in music and dance; art and craft; folklore and folktales; languages and literature; philosophy and religion; festivals and celebration; foods and drinks. Its culture is mostly influenced by Aryan, Mongolian and Tibetan culture.

Rolpa is a district situated in the Lumbini Province of Nepal. The district covers an area of diverse landscapes, including low hilly regions and to the Himalayas, providing a picturesque backdrop to its various communities. Rolpa is a name in the local kham language. Rolpa is called the settlement of Uta in the Kham language. Due to the predominance of Kham-speakers, the word Bang is added after the name of the village of Rolpa, and most of the places. In Kham language, Bang means grass. It is also a name in the Magarkham language. Rolpa district is considered to be the settlement area of 18 Magarat. The district headquarters Libang is also in Kham language. Li means bamboo and Bang means meadow, which means meadow of bamboos. With its rich cultural heritage and the rich history within its borders, Rolpa stands as a testament to the harmonious coexistence of tradition and modernity in the heart of Nepal.

Rolpa was the epicenter of the decade-long Maoist insurgency. But today, it is known for much else. The hilly district makes for an ideal destination to enjoy the serenity of nature, the culture and lifestyle of indigenous people and local delicacies. Since the end of the Maoist's insurgency, Rolpa has developed infrastructure, renovated its tourist hotspots, and carved out new trekking routes. Thus, the footfall of tourists today is incremental.

Sunilsmriti Rural Municipality which is located in the Rolpa district, Lumbini Province of Nepal is a significant area in the western part of the country and also the gateway to Rolpa district. The municipality is divided into 8 wards. Geographically, it lies in the Hilly region, characterized by its low elevated hills. With an area spanning approximately 156.57 square kilometers, Sunilsmriti Rural Municipality holds strategic importance due to its location as a major trade and

transit hub between Rolpa district and outer locations. The Rural Municipality is located between coordinate of 28° 22' 37.308" N to 28° 10' 39.9714" N latitude and 82° 36' 54.864" E to 82° 47' 57.1194" E longitude. The lowest elevation in the rural municipality is 660 m and the highest elevation is 2940 m above mean sea level.

This rural municipality shares its boundaries with several neighboring local bodies, including Rolpa Municipality and Runtigadhi Rural Municipality to the west, Sunchhahari and Lungri Rural Municipality to the East, Rolpa Municipality and Sunchhahari Rural Municipality to the North and Swargadwari and Pyuthan Municipality of Pyuthan District to the South. Its proximity to these neighboring regions fosters economic ties and cultural exchanges, contributing to the vibrant diversity of Sunilsmriti Rural.

The climate in Sunilsmriti Rural is temperate, typical of the Hilly region, characterized by mild summers and cold winters. The rural municipality experiences distinct seasons, with summer temperatures often soaring as high as 35 degrees Celsius and winter temperatures averaging minimum recorded as 3.6 degree Celsius. Monsoons bring heavy rainfall from June to September with annual mean rainfall of 1436.5 mm, which is vital for the region's agriculture.

Vegetation in Sunilsmriti Rural mainly comprises lush greenery, with sloppy lands supporting diverse crops such as maize, millet, and various fruits. The agricultural landscape is a vital aspect of the rural municipality's economy, providing livelihoods to a significant portion of the population.

Several important landmarks and places define the essence of Sunilsmriti Rural Municipality. The bustling commercial areas, markets, and transportation hub in Sulichaur serve as vital nodes connecting the region's trade and commerce. Notably, it hosts small educational institutions, religious sites, and recreational areas that contribute to its cultural and social fabric.

Demographically, Sunilsmriti Rural Municipality is home to a diverse population, representing various ethnicities, cultures, and languages. Hinduism and Buddhism are the major religion of the people of Municipality. The inhabitants primarily engage in agriculture, trade, and small-scale industries, contributing to the local economy. The rural municipality's population growth has been steady, attracting individuals seeking employment opportunities and better living standards.

The history of Sunilsmriti Rural is deeply intertwined with its strategic location and historical significance as a trade route. Over the years, it has evolved into a pivotal center for cross-district trade between Rolpa and its connectivity to other parts of Nepal, fostering economic growth and

cultural exchanges. Historical landmarks, including temples, monuments etc, offers a glimpse into the region's rich heritage.

Notable climatic conditions in Sunilsmriti Rural vary throughout the year. Summers are characterized by mild temperatures and humidity, making it essential for residents to adapt to the semi hot weather. Monsoon rains are crucial for agriculture but often bring landslides and challenges for infrastructure. Rainfall patterns are significant, with monsoons being the primary source of precipitation, contributing substantially to the region's water resources.

In conclusion, Sunilsmriti Rural Municipality stands as a vibrant and significant rural center in Rolpa district. It's geographical, cultural, and economic significance as a trade and transit hub, coupled with its rich history and diverse demographics make it a thriving community that continues to evolve while preserving its heritage.

Overall 8 wards of Sunilsmriti Rural Municipality, Rolpa, of Nepal is chosen for the study and preparation of MTMP / MTPP under this consultancy service are provided.

The location map of Sunilsmriti Rural Municipality is presented in the figure below and detailed location map is provided in Annex I, Vol I of the report.

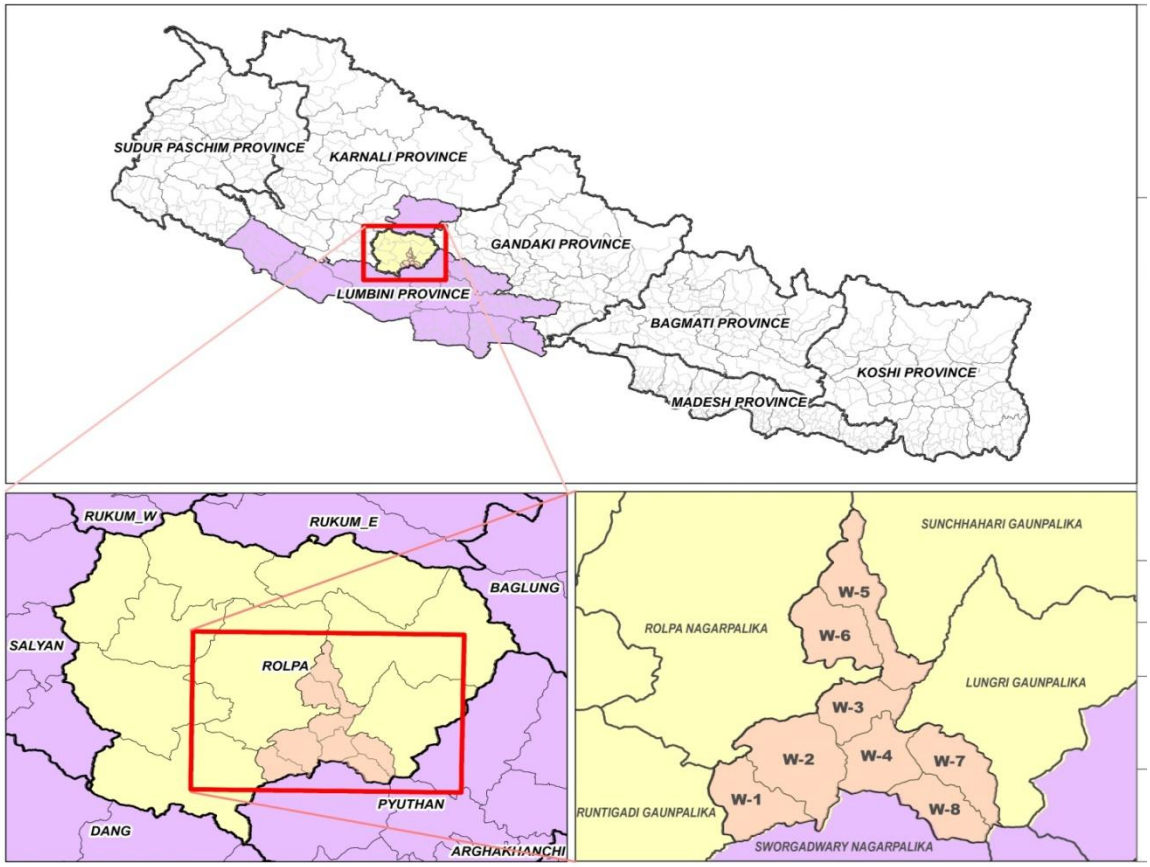


Figure 2: Location Map of Sunilsmriti Rural Municipality

3.2 SOCIO ECONOMIC & DEMOGRAPHIC STATUS

Wikipedia (2016) describes socio-economic as "Socioeconomics is the social science that studies how economic activity affects and is shaped by social processes. In general it analyzes how societies progress, stagnate, or regress because of their local or regional economy, or the global economy"., Demographics, according to Merriam-Webster "is or relating to the study of changes that occur in large groups of people over a period of time". Population data were taken from Central Bureau of Statistics (CBS). Area data were obtained from GIS satellite image.

3.3 POPULATION AND POPULATION DENSITY

Rural Municipality is populated with different castes and religions. According to the latest National Household Survey of 2021 conducted by Central Bureau of Statistics, Sunilsmriti Rural Municipality has a population of 30617 with 16522 (53.96%) female and 14095 (46.04%) male and with 7009 households. Sex Ratio is 85.31 male per 100 female. The average household size is 4.37 and population density is 195.55 people per square km. The rural municipality is divided into 8 wards. Among them, the maximum nos. of population is in ward 8 with 4556 individuals & lowest in ward 6 with 2734 individuals. Ward 4 has maximum no of household whereas ward 5 has minimum households. Overall Literacy Rate of the Rural Municipality is 74.5%. (Male 84.4% and Female 66.3%)

Ward	Household	Area (sq km)	Population			Average Household size	Population Density (per sq km)
			Female	Male	Total		
1	856	18.84	1945	1398	3343	3.91	177.44
2	993	30.01	2279	1708	3987	4.02	132.86
3	966	14.99	2147	1904	4051	4.19	270.45
4	1085	17.38	2297	2026	4323	3.98	248.73
5	682	23.38	1699	1607	3306	4.85	141.40
6	727	18.56	1577	1157	2734	3.76	147.31
7	803	18.37	2180	2137	4317	5.38	235.00
8	897	15.04	2398	2158	4556	5.08	302.93
Total	**7009**	**156.57**	**16522**	**14095**	**30617**	**4.37**	**195.55**

Table 1: Demographic data of Rural Municipality (CBS 2021)

3.3.1. HOUSEHOLD STRUCTURE

Sunilsmriti Rural Municipality consists of 7009 households with population 30617. Ward 4 has maximum household with 1085 and ward 5 has lowest household with 682. The average household size of Municipality is 4.37 people per household. Ward 7 has the maximum

household size with 5.38 people per household and Ward 6 has lowest average household size with 3.76 people per household. The average household structure of Municipality is presented in Chart 1 below.

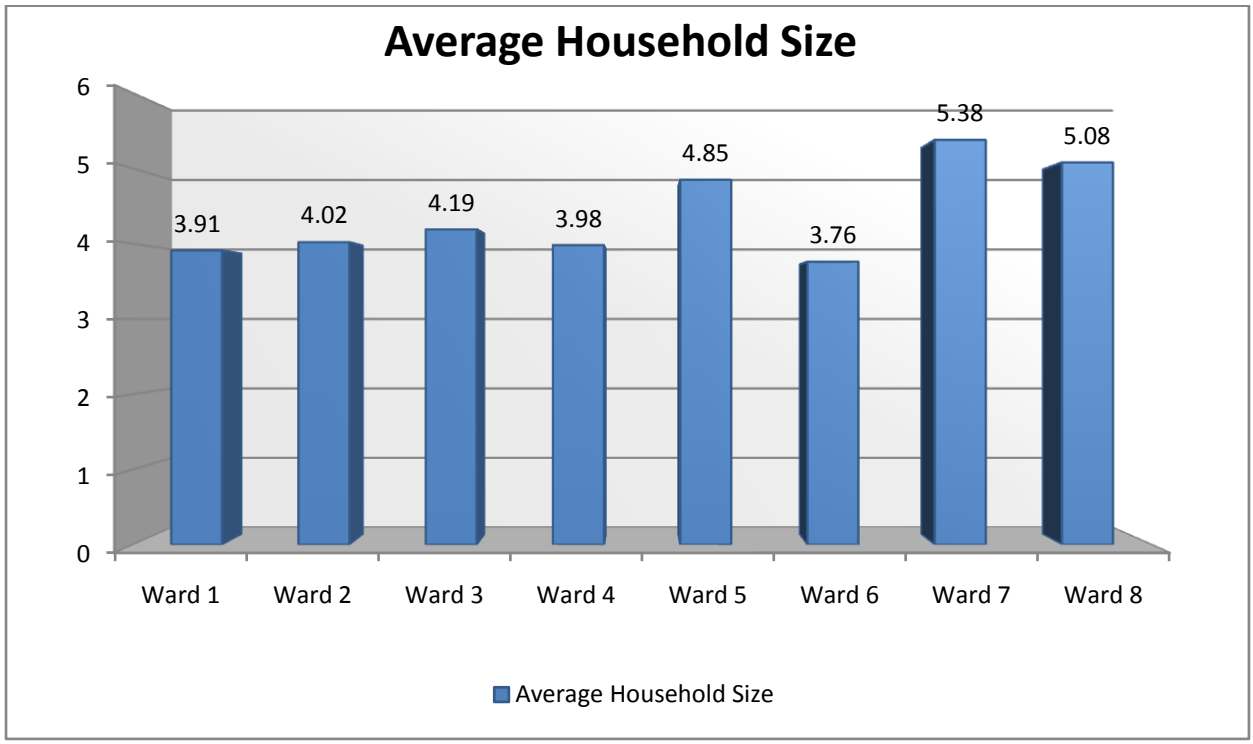


Chart 1: Average Household Size of Sunilsmriti Rural Municipality (CBS 2021)

3.3.2. EDUCATION

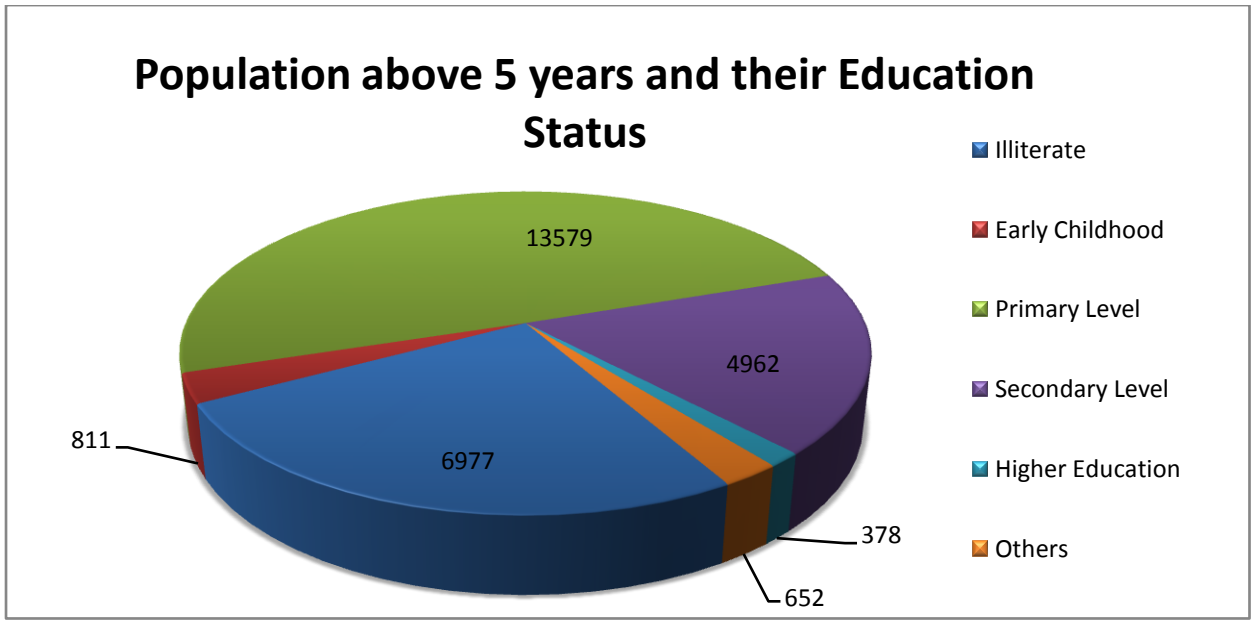


Chart 2: Population above 5 years and their Education Status (CBS 2021)

Municipality has a population of 30617 among which 27359 are above five years old. Population above five years in age is accounted for literacy status of the Municipality. Among the 27359

people, 20382 people are literate. Thus the literacy rate of Municipality was found to be 74.5% while 25.5% of population (6977 individuals) is illiterate.

From the national household survey of 2021, it is found that nearly 811 individuals (2.96%) of the rural municipality are in early childhood, 13579 individuals (49.63%) have primary level of education. Similarly 4962 people (18.15%) have secondary level whereas 378 (1.38%) are enrolled in higher level of education. About 652 individuals (2.38%) are listed otherwise.

Likewise 843 individuals are enrolled as Beginners / ECD, 8833 in Primary Level (1-5 class), 4809 in lower secondary(class 6-8), 2334 in secondary (class 9-10), 1336 are SEE & equivalent, 1292 are +2 & equivalent, 250 are graduates & equivalent, 128 are post graduates & equivalent, 5 people others, 462 have no formal education and 137 have not stated any level. The education status of Municipality is presented in Chart 2 above.

3.3.3. EMPLOYMENT PATTERN AND INCOME

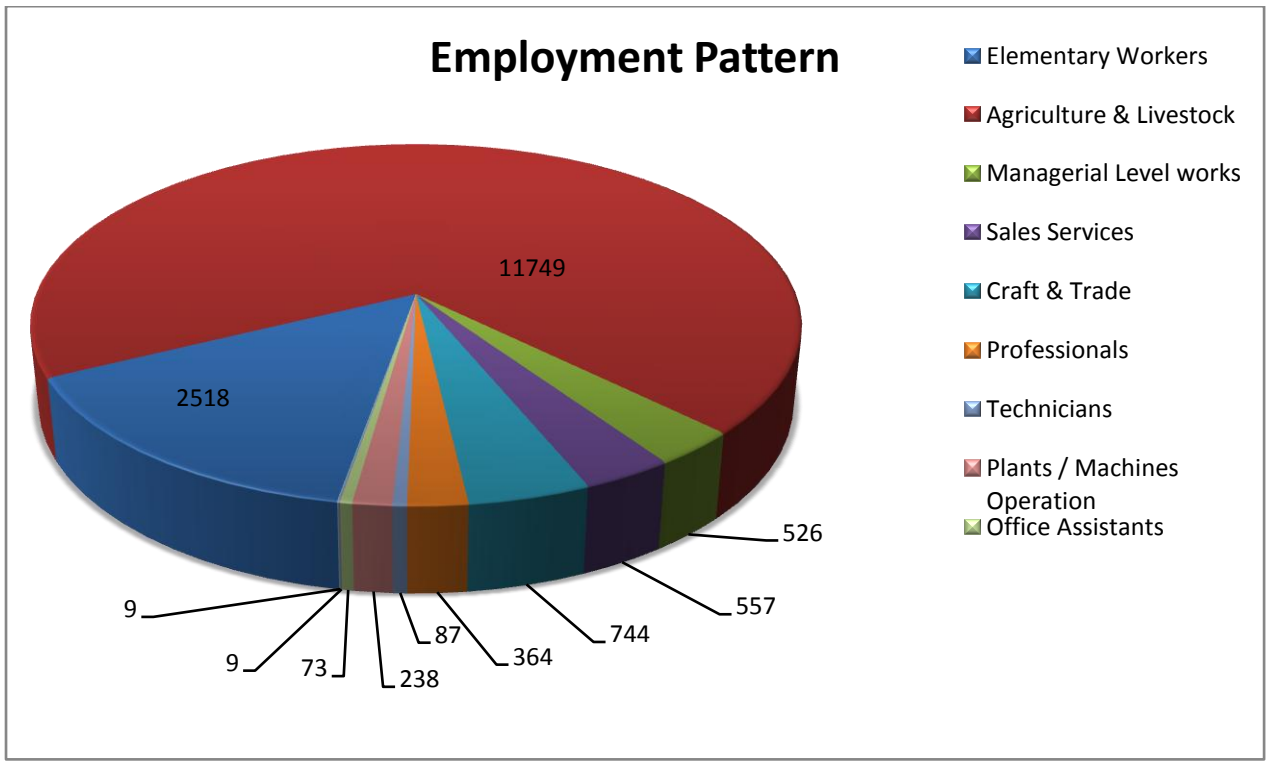


Chart 3: Employment Pattern of the population (CBS 2021)

Data from the national household survey 2021 shows that Rural Municipality has a population of 30617 out of which 6669 (21.78%) are below 10 years of age and thus cannot be considered as economically active population. There are 23948 individuals (78.22%) of population above 10 years out of which 7074 (23.10%) are absentee population. 2759 (9.01%) number of population age are not economically active whereas 14104 (46.07%) are economically active population. Similarly 11 (0.04%) individuals have not stated any status.

The majority of employment of the Municipality is seen as Agriculture & Livestock which accounts 11749 (69.63%), followed by Elementary Workers which is 2518 (14.92%) and managerial level works 526 (3.12%). Similarly 557 (3.3%) people are involved in sales services works and 744 people (4.41%) are involved in some sort of craft and trade works. 364 people (2.16%) are professionals of some sort, 87 people (0.52%) are technicians while 238 people (1.41%) are involved in plants and machines operation as a mode of employment. 73 people (0.43%) are office assistants and 9 people (0.05%) are involved as armed forces and also 9 people (0.05%) has not stated any mode..

Most of the respondents with higher education are involved in service sector. Illiteracy is highest among unemployed people while elementary workers dominate all other occupation. A majority of the household have monthly family income of less than NRs. 20000. The employment pattern of Municipality is presented in Chart 3 above.

3.4 LAND USE PATTERN

The total area of Sunilsmriti Rural Municipality is 156.57 sq. km. Out of the total area, the maximum land area is forest areas (85.83 sq. km.) followed by cultivation / built up area (47.04 sq. km). Similarly, bushes covers 15.33 sq. km. of land, Shrubs / grasses cover 5.48 sq. km., Rivers cover 0.64 sq. km., Ponds/ lakes cover 0.05 sq. km. and sands cover 2.27 sq. km. of land area.

This implies that more than half of the area of Rural Municipality is covered by forests. Cultivation area / built up area also covers significant area which is followed by bushes and shrubs. Some portion is sand while rivers also share a significant land area.

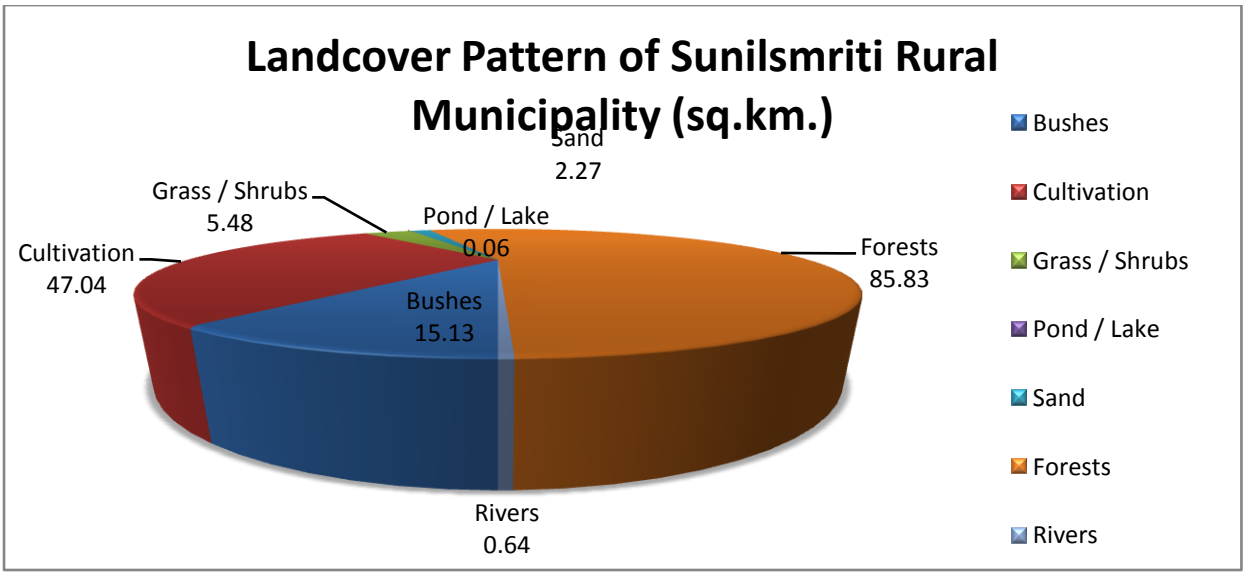


Chart 4: Land use Pattern of Sunilsmriti Rural Municipality (GIS Data)

3.5 ROAD AND TRAFFIC

Sunilsmriti Rural Municipality, like many suburban areas, experiences a dynamic and evolving situation regarding its road and traffic conditions. Several factors contribute to the overall state of transportation in the municipality. Sunilsmriti, being a rural municipality, has a network of roads connecting various parts of the municipal area. The condition of these roads vary, with some well-maintained National Highways and others facing challenges such as fair weather use, not upgraded earthen roads, potholes, uneven surfaces, or wear and tear. The rural municipality's investment in road infrastructure, maintenance projects, and development initiatives plays a critical role in shaping the quality of roads.

The access situation in rural municipality with earthen roads is satisfactory, mobility remains a critical issue due to weather dependency and the deteriorating condition of unpaved roads. Upgrading the road network, enhancing drainage, constructing protective structures, and investing in regular maintenance would significantly improve reliability and ease of movement. A coordinated approach, with attention to sustainable upgrades, could transform these roads into dependable links for rural communities, ultimately supporting local economies and improving quality of life.

The availability and efficiency of public transportation services significantly impact the overall traffic conditions. Sunilsmriti Rural has limited access of public transportation options, including only to small jeeps. The accessibility and reliability of these services influence residents' choices in commuting. Lately the rural municipality is seeing an exponential growth of such vehicles and ineffectiveness in planning and regulating such vehicles has raised a new problem in traffic management in the rural municipality.

The road situation in Sunilsmriti Rural Municipality with primarily earthen roads presents significant challenges, particularly regarding mobility and reliability The effectiveness of traffic management strategies and adherence to traffic regulations contribute to the smooth flow of vehicles. Traffic signals, road signage, and law enforcement play vital roles in maintaining order and safety on the roads. The people using the road and transport infrastructures and not fully adapted to such road regulations. The cooperation and awareness of the local community regarding traffic rules and safety practices are essential. Public awareness campaigns and educational initiatives can contribute to a more responsible and informed community of drivers, pedestrians, and cyclists.

Although the municipality is well facilitated with an Airport in neighboring municipality, still surface transport is the major mode of transport in Sunilsmriti Rural Municipality. Swargadwari

Highway (NH53) is the only National Highway linking Sunilsmriti Rural Municipality with others part of the country. Similarly there are 7 district roads within the Rural Municipality which connects the Rural Municipality with neighboring local bodies and other districts.

The rural municipality is served predominantly by earthen roads. Earthen roads, while cost-effective, are inherently less durable and require more frequent maintenance. They are often created as a means of quick access but lack long-term sustainability, especially under adverse weather conditions. Many of these roads are fair-weather only, meaning they become unusable during the monsoon season or prolonged rainfall. During heavy rains, the earthen roads soften, become muddy, and sometimes even collapse, limiting access to remote areas and restricting essential services such as healthcare, education, and market access. Almost all roads need to be upgraded, ideally to gravel or paved standards, to improve durability and ensure all-weather access. This would significantly reduce the dependence on seasonal changes and improve year-round reliability.

SRN and District Roads are the main road transport in Sunilsmriti Rural Municipality and these roads along with the major Municipal Roads constitute main proportion of traffic within the municipality. No roads within the planning area are paved except the SRN and a small part of District Road. The entire road network contains all blacktop, graveled and earthen roads. Majority of traffic is concentrated in Sulichaur; the municipal center. While the access situation in Rural Municipality is good, mobility is a problem in present traffic situation which is being tackled effectively in recent years.

Despite the basic road infrastructure, the access situation is generally satisfactory. The current road network connects most parts of the rural municipality, allowing residents and services to reach the majority of the population under favorable weather conditions. Mobility, however, remains a major problem. The lack of reliable, all-weather roads means that travel times are often long, and routes can become impassable. The situation is particularly challenging for vehicles, which struggle on rough, muddy, or flooded roads. Mobility restrictions hinder the efficiency of transportation, increase vehicle wear and tear, and raise the risk of accidents, particularly on narrow, slippery, or steep earthen paths. Restricted mobility impacts local economies as it hampers the efficient movement of goods to markets. Farmers, for instance, may struggle to transport perishable produce quickly enough to prevent spoilage, and local businesses may find it hard to maintain inventory due to erratic transport conditions.

Transitioning from earthen to gravel or paved roads is essential for creating a more sustainable and reliable road network. Gravel roads can serve as a more feasible intermediate solution,

offering better stability and reduced maintenance compared to earthen roads. Paving roads in high-traffic or critical areas would provide the best long-term benefits. Implementing drainage systems alongside the roads will help prevent water accumulation, reduce erosion, and preserve road integrity during the rainy season. Channels, culverts, and side ditches can effectively divert water away from the road surface. Building retaining walls on steep sections can stabilize slopes, prevent landslides, and protect the roads from collapse. This is especially important in areas prone to landslides or where the soil is loose. Allocating resources for regular maintenance, even outside the monsoon season, would help keep roads in usable condition and extend their lifespan. Routine grading, compacting, and filling of potholes can make a significant difference in mobility and safety. Similarly, training local communities in basic road maintenance skills and organizing volunteer maintenance days can enhance road upkeep in resource-constrained areas. Engaging residents fosters ownership of the infrastructure and ensures faster response to minor road damage.

3.5.1. ROAD INVENTORY

A Road Inventory Survey is a systematic process for collecting detailed information about a road network. It involves documenting key attributes and physical characteristics of each road segment, from its width and surface type to the presence of drainage, signage, and other infrastructure. In rural municipalities, especially those with predominantly earthen roads like Sunilsmriti Rural Municipality, a road inventory survey is essential for effective road management, planning, and prioritizing upgrades or maintenance work.

Road inventory survey was done and details of all the roads and cross structures were collected. The total length of all the roads inside the Municipal Boundary was found to be 417.71 km out of which 22.48 km is Strategic Road Network (National Highway), 73.57 km is District Roads while remaining 321.66 km are Municipal Roads. Among the municipal roads, 32.63 km is Class A road (ROW 12 m), 118.48 km are Class B roads (ROW 8 m) and 170.55 km are Class C roads (ROW 6 m). 0.58 km of roads are RCC, 23.67 km of roads in the rural municipality are Blacktop, 339.81 km are Earthen and approximately 53.65 km is to be newly constructed. For detail refer Annex.

Chart 5: Ward wise road length in Sunilsmriti Rural Municipality

From the Chart 5 below, it is found that Ward 2 has the maximum length of road (62.04 km) whereas ward 6 has the minimum road length (30.93 km).

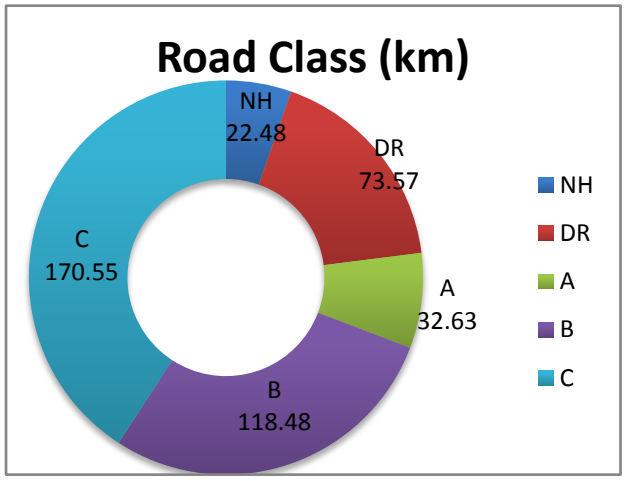


Chart 6: Road Class percentage

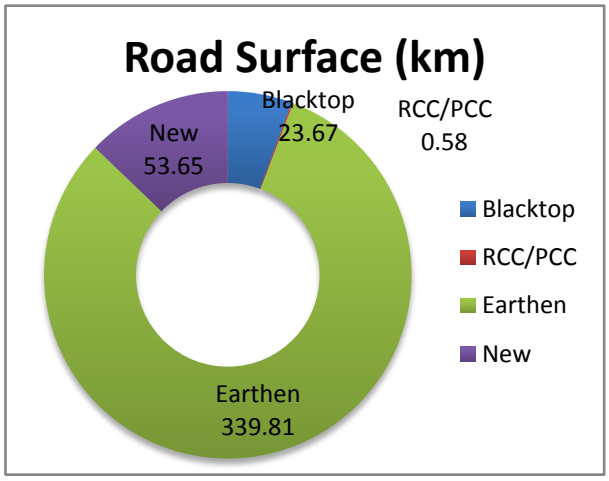
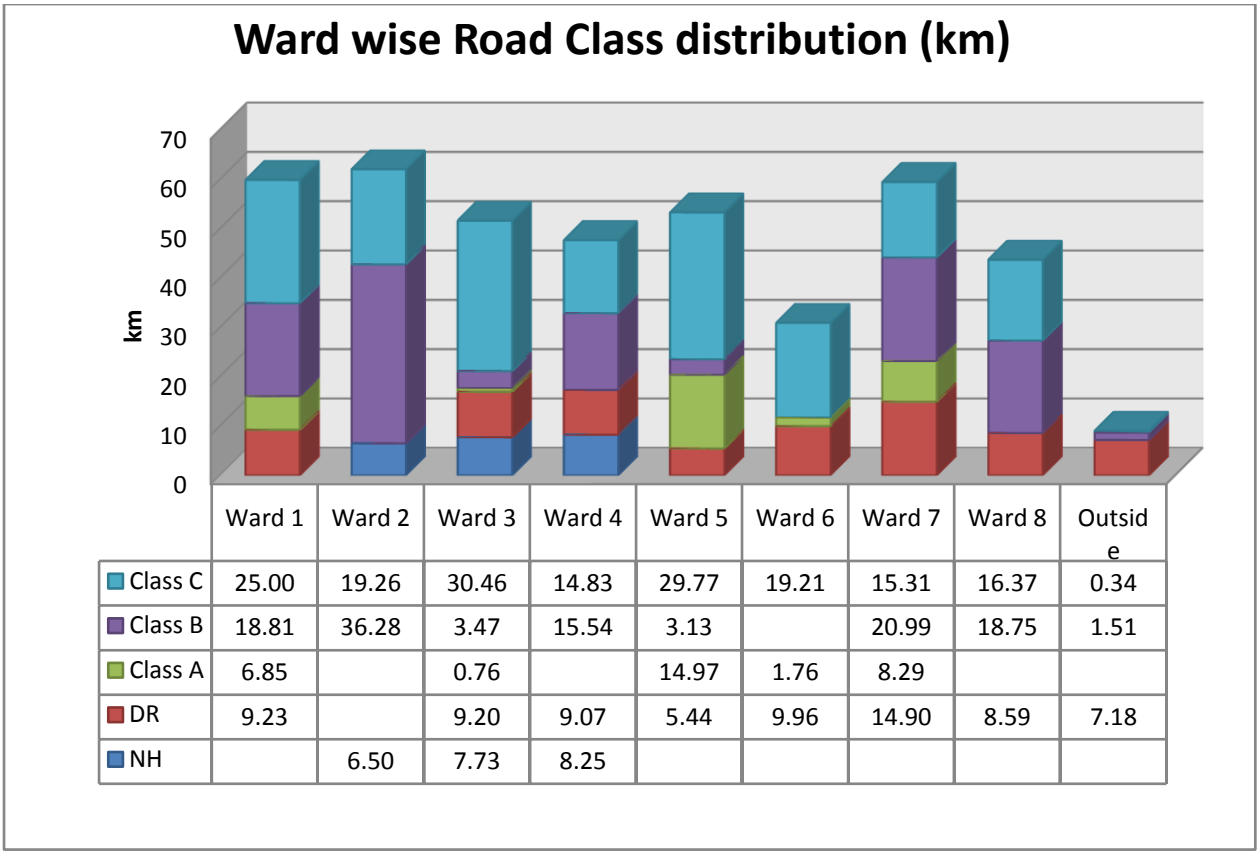


Chart 7: Road surface percentage

Class wise, 22.48 km (5.38%) of total length is National Highway, 73.57 km (17.61%) is District Road, 32.63 km (7.81%) is Class A, 118.48 km (28.37%) is Class B and remaining 170.55 km (40.83%) is Class F. Whereas surface wise, 23.67 km (5.67%) of total length is Blacktop, 0.58 km (0.14%) is RCC/PCC, 339.81 km (81.35%) is Earthen and remaining 53.65 km (12.84%) is new construction as shown in Chart 6 and 7 above.

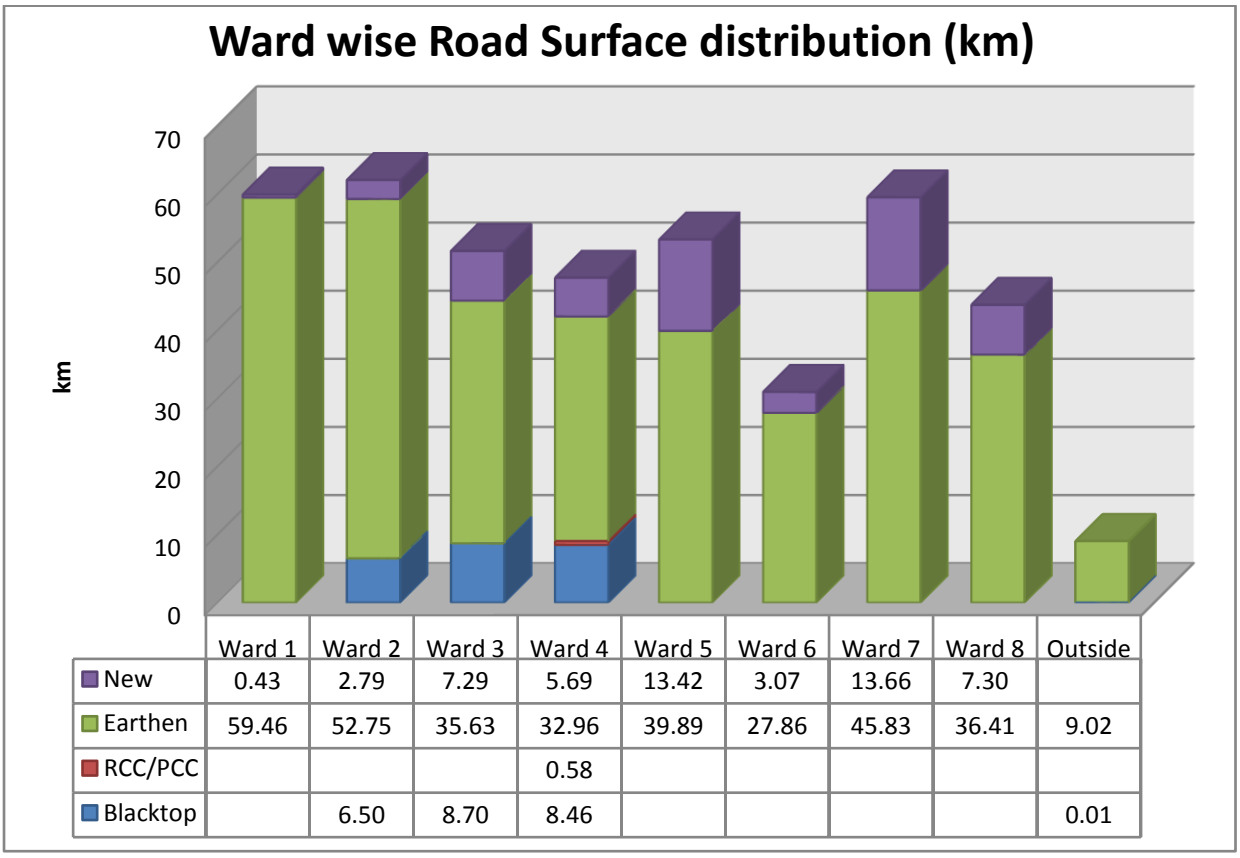
The ward wise road classification according to Class is presented in Chart 8 below.



	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6	Ward 7	Ward 8	Outsid e
Class C	25.00	19.26	30.46	14.83	29.77	19.21	15.31	16.37	0.34
Class B	18.81	36.28	3.47	15.54	3.13		20.99	18.75	1.51
Class A	6.85		0.76		14.97	1.76	8.29		
DR	9.23		9.20	9.07	5.44	9.96	14.90	8.59	7.18
NH		6.50	7.73	8.25					

Chart 8: Ward wise road class distribution

The ward wise road classification according to Surface is presented in Chart 9 below.



	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6	Ward 7	Ward 8	Outside
New	0.43	2.79	7.29	5.69	13.42	3.07	13.66	7.30	
Earthen	59.46	52.75	35.63	32.96	39.89	27.86	45.83	36.41	9.02
RCC/PCC				0.58					
Blacktop		6.50	8.70	8.46					0.01

Chart 9: Ward wise Road Surface distribution

The detailed tabular data of individual ward with the Class and Surface type are presented in Table 2 below:

Area	**Ward 1**								
Class	**NH**	**DR**		**A**	**B**		**C**		
Surface	BT	BT	ER	ER	ER	New	RCC	ER	New
Length			9.23	6.85	18.81			24.57	0.43
Area	**Ward 2**								
Class	**NH**	**DR**		**A**	**B**		**C**		
Surface	BT	BT	ER	ER	ER	New	RCC	ER	New
Length	6.5				36.28			16.47	2.79
Area	**Ward 3**								
Class	**NH**	**DR**		**A**	**B**		**C**		
Surface	BT	BT	ER	ER	ER	New	RCC	ER	New
Length	7.73	0.97	8.23	0.76	3.47			23.17	7.29
Area	**Ward 4**								
Class	**NH**	**DR**		**A**	**B**		**C**		
Surface	BT	BT	ER	ER	ER	New	RCC	ER	New
Length	8.25	0.21	8.86		15.54		0.58	8.56	5.69
Area	**Ward 5**								
Class	**NH**	**DR**		**A**	**B**		**C**		
Surface	BT	BT	ER	ER	ER	New	RCC	ER	New
Length			5.44	14.97	3.13			16.35	13.42
Area	**Ward 6**								
Class	**NH**	**DR**		**A**	**B**		**C**		
Surface	BT	BT	ER	ER	ER	New	RCC	ER	New
Length			9.96	1.76				16.14	3.07
Area	**Ward 7**								
Class	**NH**	**DR**		**A**	**B**		**C**		
Surface	BT	BT	ER	ER	ER	New	RCC	ER	New
Length			14.9	8.29	11.56	9.43		11.08	4.23
Area	**Ward 8**								
Class	**NH**	**DR**		**A**	**B**		**C**		
Surface	BT	BT	ER	ER	ER	New	RCC	ER	New
Length			8.59		16.96	1.79		10.86	5.51
Area	**Outside Municipal Area**								
Class	**NH**	**DR**		**A**	**B**		**C**		
Surface	BT	BT	ER	ER	ER	New	RCC	ER	New
Length		0.01	7.17		1.51			0.34	

Table 2: Length of Roads according to Class and Surface type of individual wards

3.5.2. ROAD DENSITY

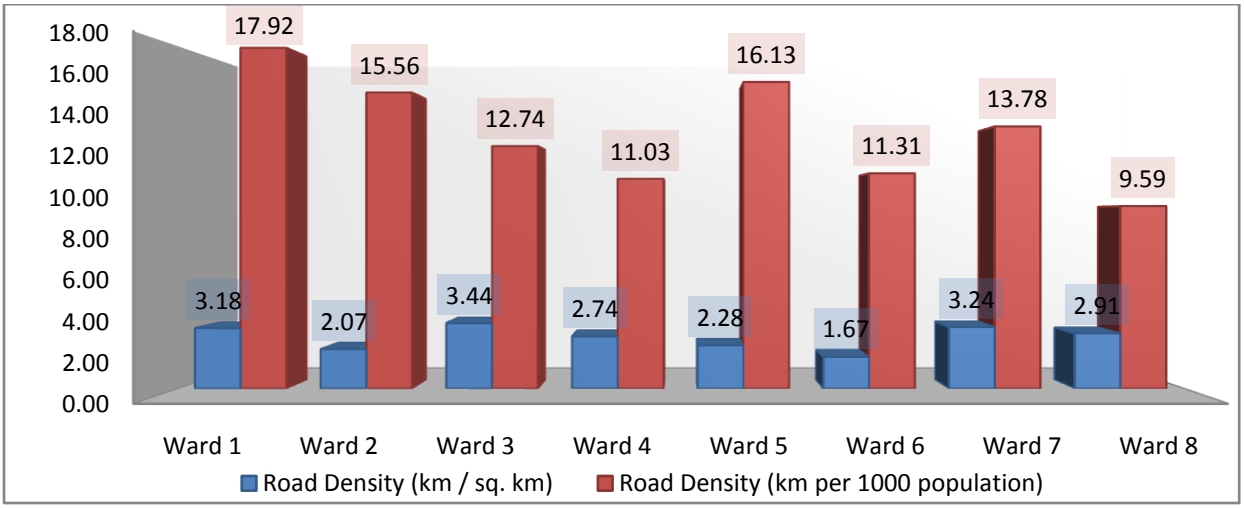


Chart 10: Ward wise road density of Sunilsmriti Rural Municipality

Currently, the road density of various wards in terms of length per sq. km of land depicts ward 3, 7 and 1 to have higher values. These wards are densely populated ward of Sunilsmriti Rural and also have significant length of roads. In case of road density per 1000 population ward 1, 5, 2 and 7 have more road density. The computation of these data is presented in Chart 10 above.

3.5.3. VEHICLE COMPOSITION

Vehicle composition of Rural Municipality is based on the Classified Vehicle Survey conducted by the study team in various roads of Sunilsmriti Rural Municipality. The traffic vehicle count was done at the following stations (for detail refer Annex II-(H)) of Volume II):

SN	Count station name	Location	Name of road Linkage
1	Sulichaur	Sunilsmriti Rural Municipality	Swargadwari Highway

Table 3: Classified Vehicle Survey Stations

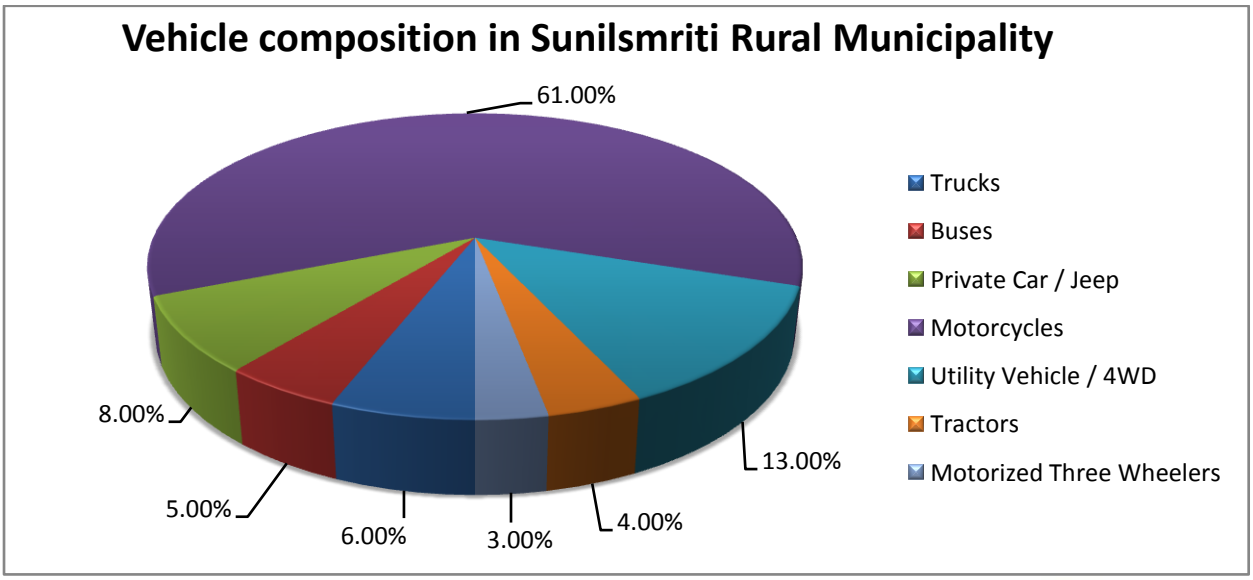


Chart 11: Vehicle composition in Sunilsmriti Rural Municipality

The composition of vehicle shows that the major vehicle that plies on the roads of Sunilsmriti Rural Municipality is Motorcycle with 61% of total vehicle composition followed by Utility Vehicles and 4WD with 13% composition of whole traffic in Rural Municipality. Other than this, private Jeeps & Cars constitute 8%, Trucks constitute 6% and Motorized Three Wheelers constitute 3% of traffic volume. Similarly, Buses share around 5% and Tractors constitute 4% of traffic vehicle composition. The representation of these data is presented in Chart 11 above.

3.5.4. VEHICLE OWNERSHIP

Vehicle Ownership of Municipality is based on the National Household Survey 2021. The ownership of vehicle shows that the major vehicle that the population of Sunilsmriti Rural Municipality own is Motorcycle with 195(2.78%) households. Cycles were owned by 20 (0.29%) households whereas 34(0.49%) households had an ownership of Cars/Jeep/Van and 11 (0.16%) households possess other vehicle type and 6749 (96.29%) households did not have any type of vehicle as mentioned in National Household Survey data. The ownership of other vehicle types couldn't be established in the national household survey. The representation of these data is presented in Chart 12 below.

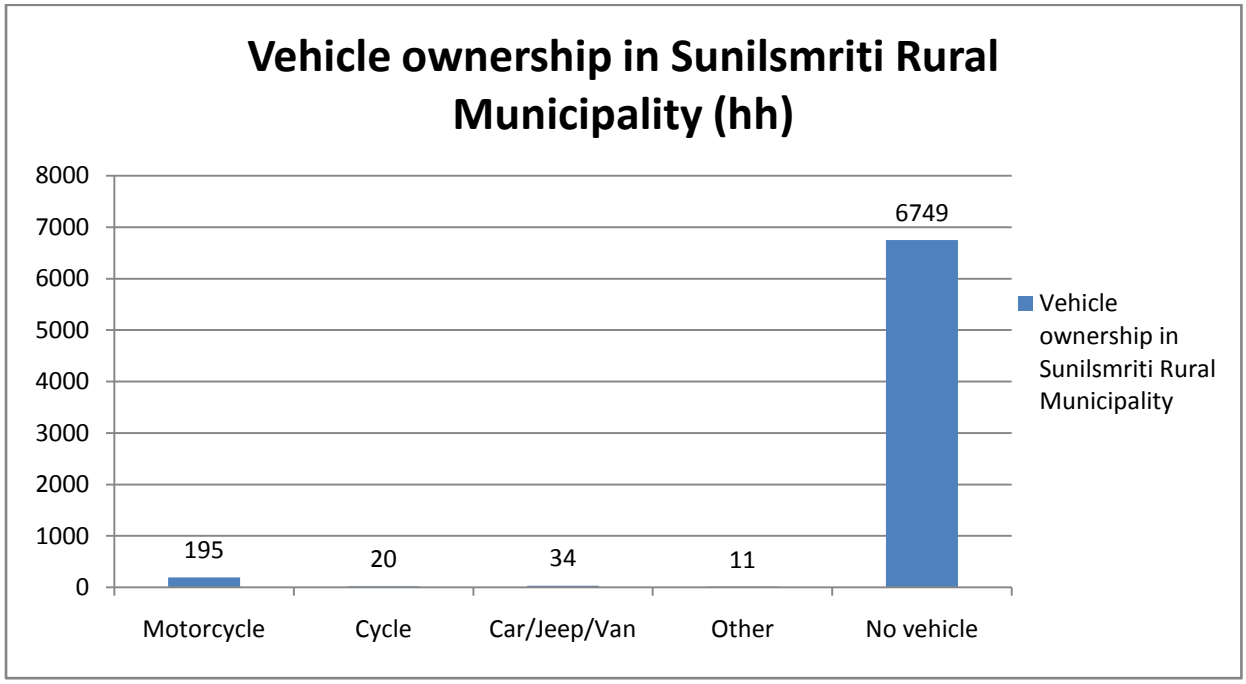


Chart 12: Vehicle ownership in Sunilsmriti Rural Municipality (CBS 2021)

3.6 TRANSPORT AND LAND USE

Population density by buildable land data shows that presently wards 3, 6, 8 and 1 do have higher density while ward 5, 7 and 2 have lower population density per hectare of buildable land. Ward 6 has the highest with 85.75 people living per hectare of settleable land while lowest in ward 5 with 7.09 people. The road density based upon buildable land shows that ward 5 has the

lowest road infrastructure developed with 2.30 km per sq. km of settlable land while highest in ward 3 with 31.99 km per sq km of settlable land. The representation of these data is presented in Chart 13 below.

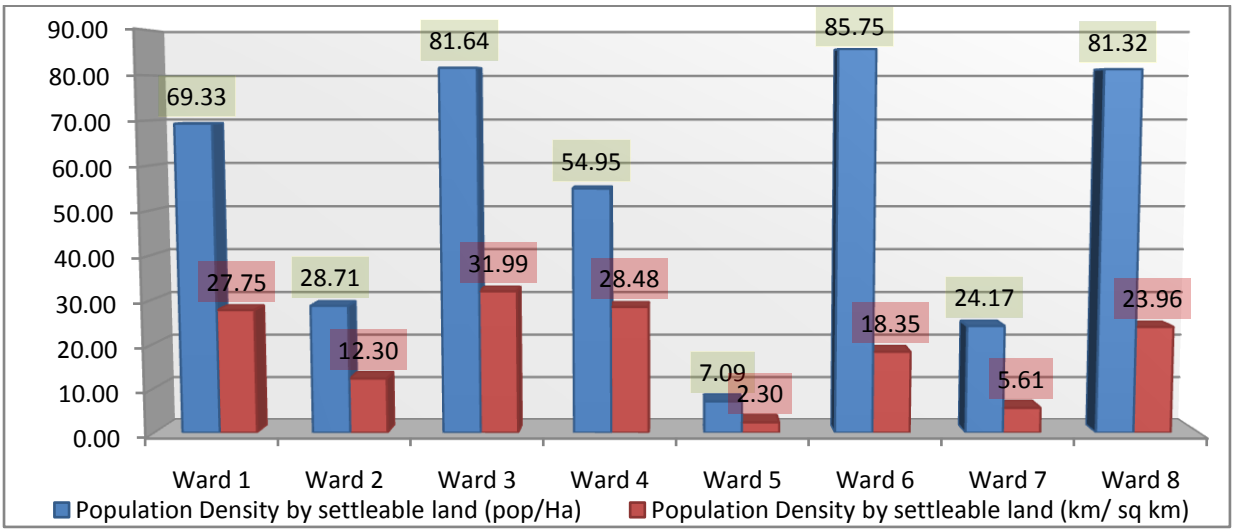


Chart 13: Population Density by settleable land

3.7 ACCESSIBILITY AND MOBILITY

The overall accessibility situation to public vehicles in Sunilsmriti Rural Municipality can be termed as poor. The data collected from origin and destination survey in various wards found out that an average person had to travel 25 minutes to board public vehicle. The population of ward 4 has relatively easy access to public transportation service with 15 minutes while ward 5 suffers the most with 40 minutes on average. Availability of dedicated public vehicle routes will further aid in boarding time. The representation of average time required for an individual to board public vehicle in all the wards of Rural Municipality is presented in Chart 14 below.

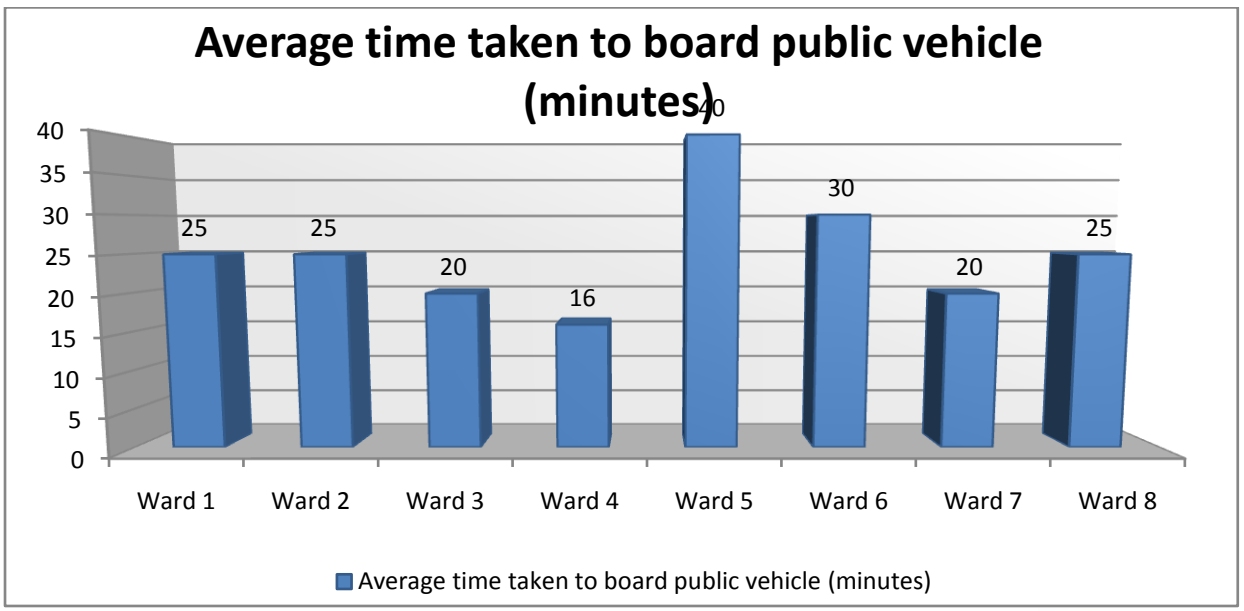


Chart 14: Average time taken to board public vehicle

A handful municipal and strategic road networks run through various wards of Rural Municipality. Public transportation service is available in these roads. The geographical location of the Rural Municipality with sloppy undulated lands which is not serviced well by road networks also aids to the fact that the accessibility situation of municipality is below satisfactory. The access of public vehicle on various wards roads and the time to reach bus stop needs a consideration as well. The mobility of transportation vehicles in ward roads for public vehicles needs consideration too.

Average travel time taken to travel to destination follows dissimilar trend to time to bus park. More or less people travel 25 minutes to get to their destination in other wards. In the past couple of years, availability of three wheeled auto rickshaw and jeeps has made the life and travel of the residents fairly easy reducing the time to board vehicle. But the fare is quite high than the other public transport so it may not be a financially viable for everyone to travel in such auto rickshaws and jeeps. Similarly the bottle neck in market places in the rural municipality, the transportation mobility is affected. There is no uniformity in road widths in majority of roads

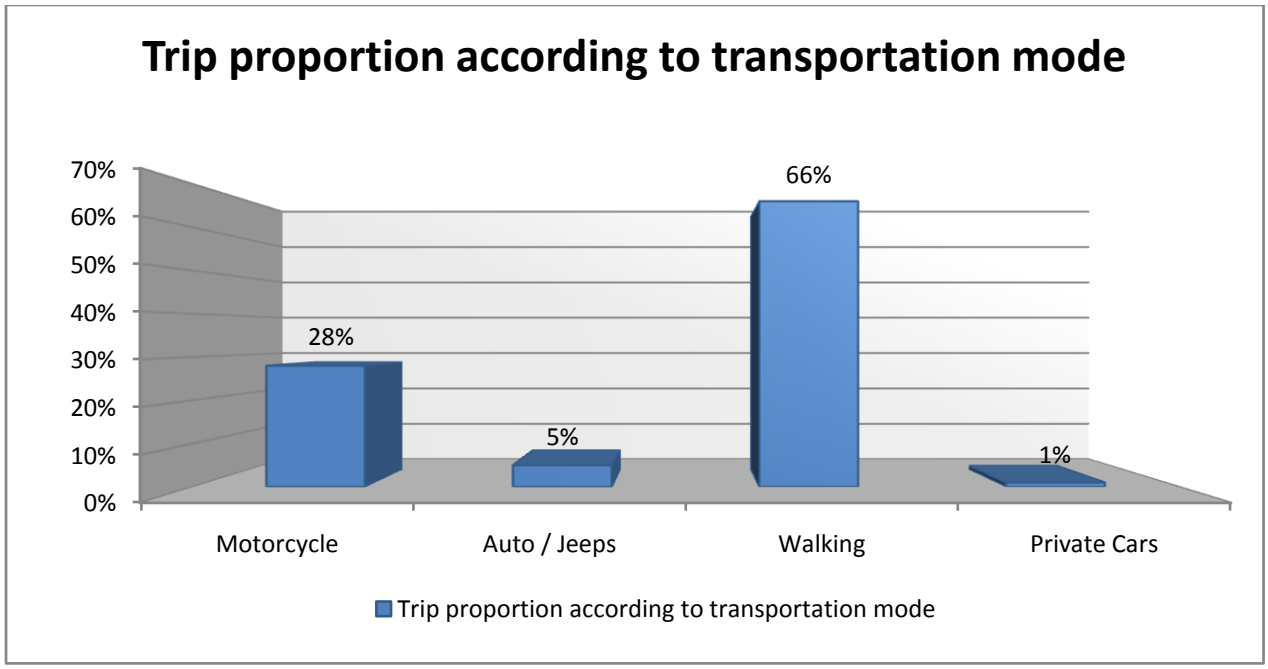


Chart 15: Trip proportion according to transportation mode

The trip proportion data for Sunilsmriti Rural Municipality reveals a strong dependency on walking as the primary mode of transportation, followed by motorcycles, with minimal reliance on public and private four-wheel vehicles. The origin and destination survey showed that a majority of trips made are by walking on foot with 66% followed by motorcycles with 28%. 5% of trips were generated through public vehicles including buses, jeeps and three wheeled auto rickshaws. Similarly only 1% of trip were generated by private four wheeled vehicles. The

graphical representation of vehicle wise trip composition in Rural Municipality is presented in Chart 15 above.

This shows that motorcycles are the most used means of motorized transportation while walking is the widely used mode of mechanized transportation. In the past recent years, introduction of small auto rickshaws and jeeps has had a vast impact on the transportation sector. Now people can easily reach their destination since these small vehicles can cover almost every road in the Rural Municipality which was impossible with heavy vehicles. So due to the road friendly vehicles and not the good road conditions, residents of Sunilsmriti Rural Municipality are now facing less hardship to board a public vehicle now than they were a few years back. Distance of travel is variable based on the mode of transportation and the destination. Still, Motorcycles are the best mean of mechanical transportation since they can reach almost every corners and roads and mobility is relatively easy in motorcycle than other mechanized means of transportation.

The population relies primarily on agriculture, local trades, and small businesses. The average income levels are modest, with affordability playing a significant role in transportation choices. Many households lack the financial means to purchase private vehicles, making motorcycles a more feasible option for those who can afford a motorized mode of transportation. The preference for walking aligns with the proximity of key destinations, such as markets, schools, and health facilities, within walkable distances for most residents. Limited economic activity means fewer trips outside the rural municipality, reducing the need for long-distance travel and, consequently, for larger, more expensive vehicles. The municipality's hilly and mountainous terrain restricts the development of wide, paved roads suitable for four-wheel vehicles, making motorcycles and walking the more practical choices. Most roads in Sunilsmriti are unpaved, often narrow, and susceptible to seasonal damage (e.g., landslides during the monsoon season). Such conditions favor the use of motorcycles, which can navigate rough terrain more easily than cars, and walking, which remains the most reliable means of transportation in these areas. Due to low population density and income levels, there is limited demand for public transport services. This reduces the economic feasibility of operating frequent or large-capacity public transportation, leading to lower reliance on jeeps, autos, or buses. Residents primarily walk because basic amenities, schools, and some health facilities are located within accessible distances, reducing the need for motorized transport on a daily basis.

Most roads in Sunilsmriti are rural and unpaved, with only a few main access routes paved or gravel-surfaced. This limits accessibility for four-wheeled vehicles, particularly private cars, which are more prone to damage on rough or muddy paths. Frequent maintenance is a challenge,

especially after the monsoon season, when rain-induced erosion and landslides often block or damage roads. Limited local budget allocation for road improvement and maintenance exacerbates the issue, making motorbikes and walking the more reliable choices for everyday mobility. The rural municipality faces funding and logistical challenges in building and upgrading roads due to the difficult terrain, frequent natural hazards, and limited local government resources. This contributes to the current transportation profile, where higher-capacity vehicles are scarce. Paths and trails have traditionally been used for movement across the rural municipality, so walking is well-integrated into the daily lifestyle of residents. This cultural inclination toward walking is further reinforced by limited public and private transportation options. Due to the average road conditions and high price to board small public vehicles, a large portion of people are still compelled to walk on foot. This has been identified as major problem in mobility and access.

To improve mobility, the rural municipality would benefit from prioritizing the paving and widening of key roads, enhancing accessibility and reducing seasonal disruptions. Increased road reliability could also encourage more robust public transport options. Investment in a modest public transport system could meet the needs of residents for whom motorcycles or walking are impractical, helping to address accessibility gaps for vulnerable groups. Enhancing pedestrian paths with steps or railings in steep areas, and covering muddy sections, could make walking safer and more accessible for the majority of residents who rely on this mode. So identifying the most used destination and upgrading the road standard to imply more public vehicles in a convenient fare is recommended in order to facilitate the people. This trip proportion data underscores the importance of infrastructure development in adapting the transportation network to better meet residents' mobility needs in Sunilsmriti's challenging geographical and economic context.

3.8 ACTIVE AND PASSIVE TRANSPORT USERS

Active transport (also called non-motorized transport, NMT and human powered transport) refers to walking, cycling, and variants such as wheelchair, scooter and handcart use. It includes both utilitarian and recreational travel activity, plus stationary uses of pedestrian environments such as standing on sidewalks and sitting at bus stops (Litman, 2015). The sample household survey shows that nearly 81% of the daily trips are done via active mode of transport. Active mode of transport is beneficial in many aspects: this mode can be used by people of any age group irrespective of gender and economic status, it consumes human energy and does not depend on fossil fuel, and it is environment friendly and provides many health benefits to the user.

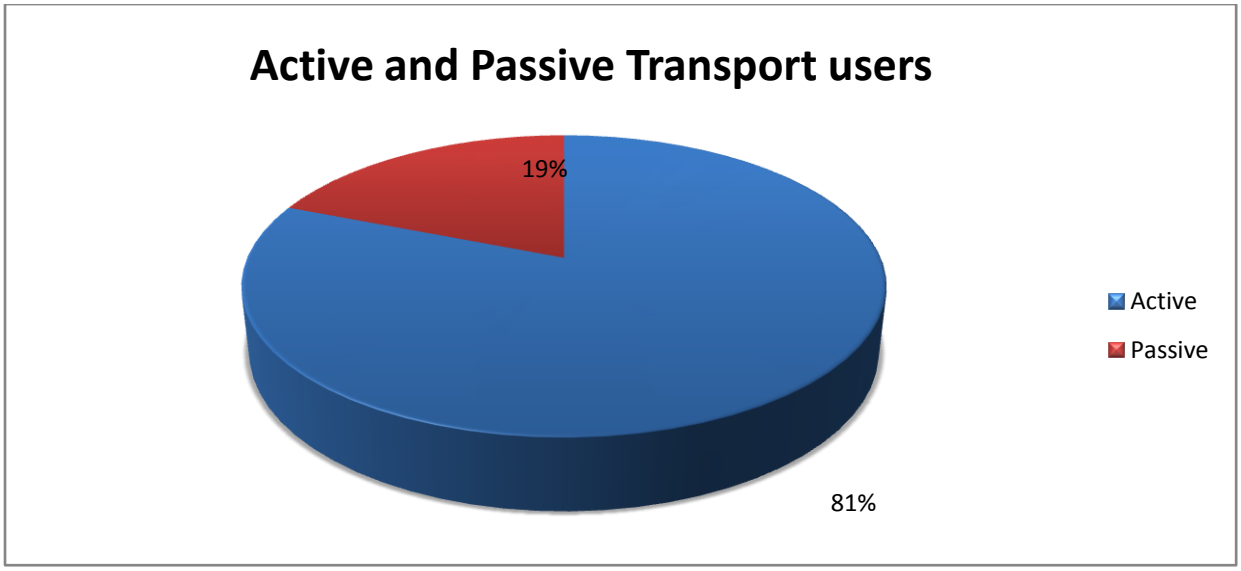


Chart 16: Active and Passive Transport users

In the rural municipality we find that the active mode of transportation is more extensively used (81%) than passive mode (19%). So this implies that the number of people travelling by non motorized means of transportation is quite more than motorized means of transportation on daily basis. The transportation scenario in Sunilsmriti Rural Municipality, where 81% of journeys are made through active modes (primarily walking and bicycling) and only 19% through passive modes (motorcycles, jeeps, or other motorized vehicles), reflects the socio-economic, topographical, and infrastructural realities of this rural area.

Sunilsmriti is a rural area where most residents engage in agriculture or small-scale trades, leading to relatively low household incomes. Limited financial resources restrict many households from purchasing or maintaining motorized vehicles, making walking the most affordable and accessible option. The rural municipality has a low population density, with communities spread across hilly terrains and valleys. Due to this scattered distribution, there is low demand for frequent, large-capacity public transport services. Rural communities have a long-standing tradition of walking for daily needs, and this preference persists due to both cultural norms and practical limitations in infrastructure. The hilly landscape of Sunilsmriti is characterized by steep slopes, narrow pathways, and unpaved roads. Such terrain is not only difficult for four-wheeled vehicles but also unsafe for larger vehicles, especially during the rainy season when roads become muddy or washed out. The narrow, rough roads that do exist are often difficult to widen or improve due to natural barriers like rivers, cliffs, and dense forests. As a result, these paths are more suited for pedestrians or motorcycles than larger vehicles.

Active modes are highly suited to Sunilsmriti's needs for various reasons. Walking is practical on narrow, rough paths that traverse difficult terrain. Additionally, they have minimal

environmental impact and do not require fuel, making them both economically and ecologically sustainable. For longer distances or less accessible routes, motorcycles are the most suitable motorized choice due to their maneuverability, affordability, and ability to navigate uneven roads better than four-wheeled vehicles. Limited demand, road conditions, and affordability make these modes less suitable for Sunilsmriti. Jeeps or shared vehicles may be used for specific needs (e.g., transporting goods, emergencies), but they are costly for daily use and unsuitable for narrow, damaged roads. Elderly individuals, children, and persons with disabilities may find it difficult to rely solely on walking, as the terrain and lack of accessible pathways create significant mobility barriers. During monsoon season, even walking becomes challenging. Muddy, slippery paths increase the risk of accidents, and landslides may block routes entirely, limiting access to essential services or emergency assistance. High reliance on active modes restricts residents' ability to travel to distant markets, hospitals, or other facilities outside the rural municipality, which impacts access to healthcare, educational opportunities, and economic development.

Developing and maintaining a basic network of paved or gravel roads that connect major villages and destinations would enhance passive transportation. Similarly, creating designated pedestrian paths with improvements such as steps, guardrails, and drainage systems could improve the safety and accessibility of walking routes. A small-scale, shared transport system using motorcycles or light vehicles could cater to longer trips and support vulnerable groups who find walking challenging. Subsidized shared services could increase mobility options for low-income families and make passive transport more accessible to those in need. Introducing affordable, reliable public vehicles such as minibuses or shared jeeps on key routes could reduce reliance on walking and motorcycles. These services would make longer-distance travel easier, connecting residents to essential services, markets, and towns. Improving drainage and landslide prevention measures along pathways and roads would make active and passive modes more reliable year-round. Investing in landslide control structures, retaining walls, and erosion-resistant materials would reduce seasonal disruptions. So a systematic transportation network should be developed to avoid the chaotic, unsafe and unplanned road networks and facilitate people with a well distributed network of roads. Sunilsmriti's high reliance on active transportation reflects the area's geographic challenges, limited infrastructure, and economic landscape. While active modes are appropriate and sustainable, strategic investments in pathway upgrades, shared vehicle options, and limited public transportation services could greatly enhance mobility and accessibility without disrupting the local environment. In this way, the municipality could ensure

a more balanced transportation scenario that supports both active and passive modes, improving access to services, enhancing quality of life, and fostering inclusivity.

Public Transport and Road Safety

In Sunilsmriti Rural Municipality, public transport is limited, and road safety remains a key concern due to the rugged terrain, minimal infrastructure, and a high reliance on walking and motorcycles. Given the area's transportation patterns—where 66% of trips are on foot, 28% by motorcycle, and only 5% on public transport—the rural municipality faces unique challenges in establishing safe, reliable, and accessible public transportation options.

A few years back, the use of public transportation for daily trips was limited to very few municipal and SRN roads while no public transport were plying along majority of municipal road sections. But introduction of small public vehicles has been a blessing in transportation sector and now most of the roads have access to public vehicle.

Mobility relies on the privately owned vehicles, small public vehicles or walking. Due to the introduction of small public transport vehicles and services, a ground level public transportation system has been established. However not everyone can afford it on a daily basis.

With only 5% of trips utilizing public vehicles, public transportation options such as shared jeeps or small buses are limited. These vehicles are often used for specific purposes, such as transporting goods or connecting villages to nearby towns. However, they are infrequent and largely demand-driven due to low population density and the challenging terrain. Public transport in Sunilsmriti primarily consists of informal shared services, like jeeps that operate irregularly, based on demand. Such services are often under-regulated, with vehicles that may not meet safety standards. The limited public transport options do not cater effectively to those who may find it difficult to walk or ride motorcycles, such as the elderly, disabled, or young children. This restricts these groups' mobility and access to services, particularly in emergencies or for long-distance travel.

Roads in Sunilsmriti are mostly unpaved, narrow, and winding due to the hilly terrain. These conditions pose safety risks, particularly for motorcycles, which account for 28% of all trips. Steep gradients and poor road surfaces increase the likelihood of skidding or losing control, especially during the monsoon season. Landslides, mud, and erosion during the rainy season make roads treacherous and often impassable. This not only disrupts public transport but also poses risks for pedestrians and motorcyclists, with routes frequently blocked by debris. Road safety measures, such as guardrails, signage, and pedestrian walkways, are limited. This is

especially problematic for vulnerable groups and increases the chances of accidents for both pedestrians and motorcyclists. Roads often lack clear markings or lighting, which is essential for ensuring safety on winding, narrow paths. In the event of road accidents or landslides, emergency response times can be delayed due to road conditions and limited access to ambulances or other emergency transport services. This poses a significant safety concern, particularly for remote areas within the rural municipality.

The informal nature of shared transport options often means that vehicles are poorly maintained and may lack proper safety features, such as seatbelts or emergency exits. Drivers may also lack formal training, contributing to unsafe driving practices. Road safety awareness is limited in rural communities. Motorcycle riders, for example, may not consistently use helmets, and pedestrians may not follow standard road safety practices, such as walking against traffic on narrow roads. These factors increase the risk of injuries or fatalities. Motorcycles are the most common form of motorized transport but come with higher accident risks due to their vulnerability on rough and narrow roads. With limited availability of public transport, residents often turn to motorcycles, even on challenging routes where safety risks are high.

Improving and expanding key roads by paving, widening, and adding drainage systems would enhance safety for all users. Strategic upgrades on essential routes, particularly those connecting major villages, schools, health posts, and markets, would support both public and private transport. Establishing a small-scale, subsidized public transport service could provide reliable transportation on key routes. Small buses or minibuses with regular schedules could cater to residents who cannot rely on motorcycles or walking. These services should prioritize safety by enforcing vehicle maintenance, driver training, and passenger capacity limits. For pedestrians, constructing safe walking paths, adding guardrails in steep areas, and improving signage would help minimize risks. Given the high risk of landslides during the monsoon, investing in landslide prevention infrastructure (e.g., retaining walls, drainage channels) along vulnerable roads can minimize seasonal hazards. Additionally, establishing an early warning system for road users and training emergency responders would improve response times and accident management during peak risk seasons.

3.9 SUMMARY AND FINDINGS

Literacy rate is mid and the sample shows that education level above plus two levels is very low. Unemployment among the non-student sample is high. Almost half of the sample population is involved in earning jobs. Most of the population is involved in elementary occupation. In any sector of occupation, people with high level education are dominant. Service sector has

employed most of the people with Bachelor level education. As the monthly income level of households increases, the proportion of family members pursuing education is seen to increase and so does the proportion of individuals involved in business and service.

Road transport is major transport mode for movement in Sunilsmriti Rural Municipality and facilitated mainly through SRN. Built up area is quite middling so there is still probability for settlement expansion in the municipality. Vehicle ownership is very low among the people of the rural municipality. Sunilsmriti Rural Municipality shares a fair portion of earthen roads followed with intermediate carriageway. The vehicle composition shows that most of the vehicles that ply along the roads are motorbikes. The transportation scenario in Sunilsmriti Rural Municipality highlights both challenges and opportunities in providing safe, accessible public transport and ensuring road safety. While the high reliance on walking and motorcycles reflects geographic and economic realities, strategic investments in road upgrades, safe public transport services, and community safety awareness programs would address key issues. By improving infrastructure and promoting a safety-conscious culture, Sunilsmriti can enhance mobility for its residents and make daily journeys safer, more reliable, and inclusive for all.

CHAPTER 4: PERSPECTIVE PLANNING

This section discusses about the future anticipated population and the traffic and the planning road infrastructure to cater these traffic in short, medium and long term.

4.1 PROJECTION OF POPULATION

The underlying assumption for the preparation of MTMP is that, the designated municipal area has a growing population and in the future will fulfill the population criteria (one of many criterion to be a municipality) to be a municipality. As such the rural municipality will be an urban area or an urbanizing area. One of the characteristics of an urban area is higher population densities and corresponding higher demand for services and facilities all of which directly demands proper transport infrastructure. For sustainable supply of transport infrastructure, it is pertinent to forecast the population in the future so that the infrastructures can be planned and constructed accordingly.

A population forecast requires certain information on historic population counts, births, deaths, other rates which affect population change. Population forecasting is essentially a matter of judgment in selecting the kind of forecast to present, in determining the procedures for making it, and in appraising effects of the factors that induce population changes. The problem, of course, is much simpler for areas which have shown marked stability in the size of their populations for several decades, and for which no great change in the economic and social conditions of the locality seems likely. On the other hand it may be extremely difficult and complex for areas which have had sharp fluctuations in the direction or rate of population change in the past, and which may continue to have them.

The main factors affecting the population projection are birth rate, death rate and migration to the city/town concerned. Out of these factors, the migration is chief factor. The factors for migration may be the desire for better economic opportunities, desire for better living or housing conditions (this applies particularly to short distance migration within the same general locality), movement for reasons of health, education, or retirement etc. The level of national economic activity also affects the direction of migration. When employment is high or rising, the movement is generally from rural areas and small towns to the medium-size and larger cities, because of the relatively larger rate of wages and economic opportunities in urban areas.

In the present time the urban population is increasing in high rate although the proportion of it is very small. To forecast the population in the municipality for the preparation of MTMP the geometric method have been used considering the rapid urbanization of the area. For this the following formula is used:

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

Where, IG = geometric mean (%)

P = Present population

n = no. of decades.

P_n=population at the end of n^{th} decade

By using this method we found that the average growth rate of population in this municipality is on average 8.52% as shown in *Table 4* which indicates urbanization. This may be due inter district migration and migration from other local bodies and districts. Based on this trend, the average projected population of this rural municipality on the year 2031 will be 33226.

Municipality	Population of Year		Growth Rate (%)	Present Year Population (2024 AD)	Remarks
	2011 AD	2021 AD			
Sunilsmriti Rural	28213	30617	**8.52%**	31378	Avg. growth rate

Table 4: Population Growth Rate and Base Year Population

4.2 INDICATIVE DEVELOPMENT POTENTIAL

IDP is basically the indication of the existing and potential market center/service centers (key growth centers) and the areas having various development potentials such as agro-based industries, high value cash crops and tourism. Thus, IDP shows high value cash crops, tourism area, and area of service centers such as hospital, post office, telecommunication, school, campus, security offices and large settlements, important historic and religious places. Finally it prepares the ranking of the markets of the municipality as the basis of network planning.

For Sunilsmriti Rural municipality, the following areas have been proposed for the potential development area.

S.N.	Development Potential	Area
1	Institutional	Sulichaur
2	Major Touristic & Religious	Ward 1: Ghodakot Shivalaya Mandir, Thupaki Barahthan, Khadgathan, Redsoil Park, Dhad danda, Barahthan, Pyapa Shivalaya, Barneta Shiva Mandir, Darmekhola Silajit Pahad, Sallipipal Shiva Gufa

S.N.	Development Potential	Area
		Ward 2: Tripurasundari Mandir, Shiva Panchayan Mandir, Khungrikot Durbar, Barahthan
		Ward 3: Ghagethan, Bhadaurethan, Thamlekh Haredhara, Ruinibang Park, Barahthan
		Ward 4:Koiralkharka Bhogane Gufa, Halhale Barahthan, Bhumisthan Bagma
		Ward 5: Qwaligaun Barahthan, Managa Barahthan, Kaabra Barahthan, Rija Barahthan, Ratabhir
		Ward 6: Gajulkot, Thamalekh, Pateshwori Mandir, Sunilsmriti Park, Baghkhor Gufa
		Ward 7: Lisne Danda, Malaranikot, Shanti Batika, Rajyapokhari, Shivalaya Mandir
		Ward 8: Aresh Thulothan, Dhungesagu, Lisne, Damdame, Thamalekh, Sisnekhola
3	Commercial area	Ghodagaun, Thumpaki, Khungri, Ruinibang, Sulichaur, Qwaligaun, Kaabra, Thati, Dalanga, Rajyapokhari, Tebang, Lek, Chinne, Aresh
4	Future Urban Expansion	• Ward 1 (Ghodagaun, Thumpaki) • Ward 4 (Wallo Chirne, Pallo Chirne) • Ward 7 (Jaupokhari, Okhola, Rawang, Ghurlidhara) • Ward 8 (Chipchipe)
5	Agricultural area	• Ward 1 (Ghodagaun, Thumpaki, Bhalawang, Ghodakot, Panchikot, Obang) • Ward 2 (Khungri, Mahendri, Harigaun, Goganpani, Hile) • Ward 3 (Tallokharka, Upallokharka, Lampuja, Mijhing) • Ward 4 (Baghma, Chirne, Tallogaun)

S.N.	Development Potential	Area
		• Ward 5 (Managad, Tallokatni, Syala) • Ward 6 (Patihalna, Panipokhara, Kuwapani, Dalanga, Dhauligaun) • Ward 7 (Tebang, Lek, Kharbang) • Ward 8 (Lek, Phuldhara)
6	Industrial Area	The rural municipality has not yet defined an industrial area within the municipal boundary.
7	Bus Station	Sulichaur, Ward 4
8	Nagar Stadium	The rural municipality has not yet defined.
9	Landfill Site	The rural municipality has not yet defined.
10	High Density Residential Area	Ward 1: Ghodagaun, Thumpaki, Panchikot, Tusarpani
		Ward 2: Khungri, Harigaun, Mahendri, Hile
		Ward 3: Ruinibang, Mijhing, Daibang
		Ward 4: Sulichaur, Bagma, Koiralkharka
		Ward 5: Kaabra, Qwaligaun
		Ward 6: Dalanga, Panipokhara, Gajulkot
		Ward 7: Rajyapokhari, Tebang, Lek
		Ward 8: Chinne, Aresh, Lek
11	Low Density Residential Area	Ward 1: Obang, Gandarvabasti, Dharbang, Sarangdhara, Dhikpur
		Ward 2: Goganpani, Khalisinge, Khungrikot, Dhanachaur
		Ward 3: Shandak, Lampuja, Lek, Harro
		Ward 4: Wallo Chirne, Pallo Chirne
		Ward 5: Managa
		Ward 6: Kuwapani, Dhauligaun

S.N.	Development Potential	Area
		Ward 7: Kobaja, Gharlidhara, Laire, Kharikhola
		Ward 8: Gurase, Chipchipe

Table 5: Indicative development potential areas of Sunilsmriti Rural Municipality

4.3 TRANSPORT AND LAND USE

Land-use potential is a measure of the scale of socioeconomic activity that takes place on a given area of land. A unique property of land use is its ability to generate traffic. The connection between transportation and land use is a fundamental concept in transportation. Everything that happens to land use has transportation implications and every transportation action affects land use. Actions by transportation agencies shape land use by providing infrastructure to improve accessibility and mobility.

Planning of any land-use and transportation system is to ensure that there is an efficient balance between land-use activity and transportation capability. Trip generation provides the linkage between land use and travel as depicted in the below cycle.

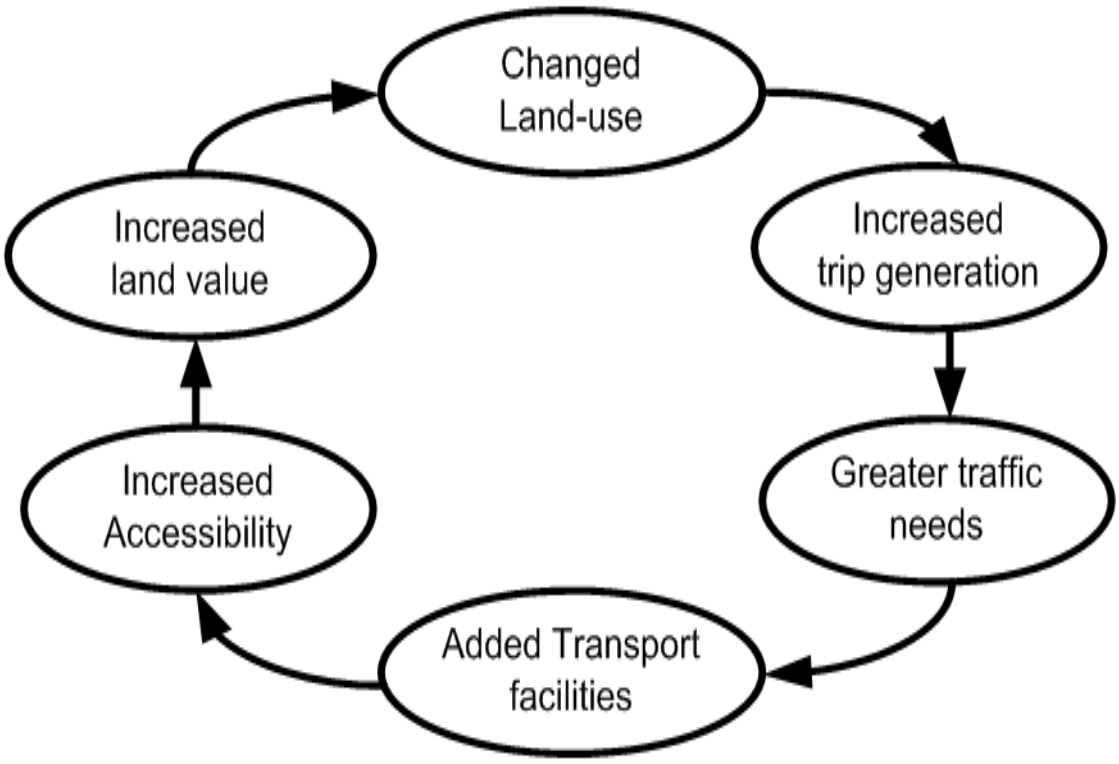


Figure 3: Relationship of land use and transportation model

4.4 ACCESSIBILITY AND MOBILITY SCENARIO

Transportation system most often needs to trade-off between accessibility and mobility. Need of travel is a derived demand, not being end in itself but a means. Accessibility is the ease with which goods, services, people and opportunities can be reached. In the context of Sunilsmriti Rural municipality with core market centers as epicenter of all goods, services and facilities, people lying on the peripheral regions need accessibility.

Mobility is efficient movement of goods and people. Mobility is more focused on trips and distance covered. Mobility values transportation as end rather than means, but still in outlying areas accessibility requires a lot of mobility, while central population need smaller trip lengths. While we provide space for active mode users and public transits as a means of enhancing accessibility, we are trading a part of road space from the mobility sector, and when we provide more road space for private vehicles to move efficiently we trade part of road space associated with accessibility.

The mobility and accessibility scenario in Sunilsmriti Rural Municipality reflects a complex interaction between available infrastructure, terrain, socio-economic factors, and safety concerns. While the area has satisfactory accessibility due to a sufficient network of roads reaching most parts, the quality of these roads—primarily earthen and unpaved—significantly hampers mobility, making travel challenging and time-consuming.

The municipality has a reasonably extensive road network that allows residents to access most parts of the area, including essential services like schools, health posts, markets, and administrative centers. This network ensures that many villages and localities are connected, supporting the population's basic needs for transportation. Due to the accessible road network, most residents can reach basic services within walkable or short driving distances. This road coverage is essential for maintaining connectivity in a region where many rely on walking or motorcycles. The road network enables a high rate of walking and motorcycling trips, indicating that residents can typically reach their destinations without excessive detours or barriers. Even though these roads are primarily unpaved, they fulfill the essential function of connecting remote communities to services and resources.

Most roads are earthen and unpaved, meaning they become difficult to navigate during the rainy season. Muddy, slippery roads make mobility particularly challenging for motorcyclists, and pedestrians may struggle with safety and accessibility in adverse weather. The poor condition of roads restricts the use of four-wheeled vehicles, especially private cars and even some public transport options. Jeeps and other high-clearance vehicles can manage rough roads to some

extent, but narrow paths and steep gradients limit the practicality and speed of travel, especially on a daily basis. The monsoon season exacerbates mobility issues as rain-induced landslides and erosion often block roads, limiting access to essential services or requiring lengthy detours. During these times, accessibility may become unreliable, and residents may face increased isolation, particularly in more remote villages. Given the challenging road conditions, motorcycles are a primary mode of transport for those who can afford them. However, motorcycles are susceptible to skidding on uneven or muddy paths, and the limited availability of safety features (e.g., helmets, protective clothing) increases the risk of accidents. Poor road conditions and limited public transportation options hinder emergency responses, as ambulances and other emergency vehicles may be unable to reach remote areas promptly, putting vulnerable populations at risk.

The hilly terrain of Sunilsmriti makes road construction and maintenance complex and expensive. Building wider, paved roads through steep and uneven areas is a logistical challenge, and budget constraints limit the rural municipality's ability to upgrade the current earthen roads. The rural municipality's modest budget constrains the scope of road improvement projects. While the existing network suffices for access, upgrading these roads to improve mobility (e.g., paving, widening, and drainage installations) requires significant investment, which is often out of reach. Limited road maintenance leads to rapid deterioration, especially during the monsoon season. Earthen roads require regular upkeep to remain functional, but resource constraints mean that maintenance is often infrequent, leading to prolonged periods of degraded mobility.

Present scenario of Sunilsmriti Rural reflects the access to bus stop on an average about 30 minutes, Class "A", "B" and "C" roads that are planned for public vehicle to ply are expected to reduce this time to within 15 minutes. People will have access to either Class "B" or Class "A" roads designed for more mobility within 15 minutes on an average walking distance that are designed for greater mobility. Planning work has focused on reducing access directly to highways, subsequent developments are recommended for national authority to develop required infrastructures.

Paving critical sections of roads, particularly those that connect major villages or lead to essential services, would greatly improve mobility without necessitating full-scale road upgrades. Even graveling key routes can enhance usability, especially during the rainy season. Establishing a seasonal maintenance program focused on clearing landslides, reinforcing drainage, and stabilizing roads with erosion-resistant materials would improve mobility during peak disruption times. Retaining walls, improved drainage channels, and regular debris clearing would make

earthen roads more resilient. Establishing reliable, small-scale public transport services (like minibuses or shared jeeps) that operate on major routes could reduce residents' dependence on motorcycles and provide a safer, more comfortable travel option. This would also help ensure mobility for those unable to walk long distances or ride motorcycles. Providing affordable safety gear like helmets and organizing training programs on safe riding practices would reduce accident risks for motorcyclists navigating poor road conditions. Encouraging safe riding behavior and increasing awareness of road safety could mitigate some of the risks associated with poor mobility. Improving pedestrian paths with steps, gravel, or protective railings on steep sections would enhance mobility for walkers, who constitute a significant portion of the municipality's commuters. Pathway upgrades are relatively low-cost but provide immediate mobility benefits, especially in wet or muddy conditions.

Sunilsmriti Rural Municipality's transportation infrastructure presents a paradox where accessibility is relatively satisfactory due to the presence of a network of roads reaching most parts, yet mobility is hampered by poor road conditions that limit reliable, fast, and safe travel. The reliance on earthen roads is practical from an economic standpoint but presents significant limitations to daily and seasonal mobility.

Strategic upgrades—focused on selective paving, seasonal maintenance, and pathway improvements—could provide substantial improvements in mobility without necessitating high-cost interventions. Developing small-scale public transportation options, enhancing safety measures for motorcyclists, and implementing community awareness programs on road safety would also play essential roles in creating a more effective and inclusive transportation environment. This balanced approach would allow Sunilsmriti to build on its existing accessibility while addressing the critical need for improved mobility and road safety in a cost-effective and sustainable manner. By adopting a holistic approach that combines infrastructure development, technological solutions, and community engagement, Sunilsmriti Rural Municipality can work towards creating a more accessible and efficient transportation system that meets the needs of its residents.

4.5 TRANSPORT INFRASTRUCTURE PLANNING

Land use and transport, developed road hierarchy, accessibility and mobility scenario are the policy level guidelines for development and planning of transport infrastructures.

Nearly the ownership of vehicle shows that the major vehicle that the population of Sunilsmriti Rural Municipality own is Motorcycle. Thus from the perspective of sustainable transport also, we need to protect the peoples' utilization in planning works.

While 81% of the trips made as of today is by active mode of transportation, the planning works has incorporated footpaths for pedestrians segregated from carriage-way width.

With projection of population at present growth rate of 8.2%, population would rise above 34000 in 10 years which will certainly grow in economic size and have better income scenario. People will aspire to have private vehicles of their own to increase mobility, requiring greater road space width which will be provisioned by class A and class B roads but the aim of sustainable transport and accessibility policy will be to check private ownership of vehicles under control.

Class A and Class B road would have provision of bus-bay to facilitate public transit riders. Green belts would be developed for aesthetic purpose and noise reduction purpose as well as segregation of pedestrians from road traffic. Road side furniture would be installed as deemed necessary.

4.6 SHORT TERM MUNICIPAL TRANSPORT MASTER PLAN (FIVE YEARS)

The short term municipal transport master plan has been developed to guide the municipal investments on road infrastructure through 2025-2029. This short term plan will mainly focus on the demand by the people and for the accessibility of the people in the first step. The plan will advance the municipality towards the medium and long term plan as outlined in the later topics.

Short term planning elements generally known as transportation system management (TSM) are basically meant for efficient use of existing and proposed infrastructure (Verma & Ramanayya, 2015). Short term MTMP refers to maintenance and upgrading of the existing road networks to the proposed standards to support the present and future (5 years) transport demand paving the demand for the implementation of medium term and long term plan. It also includes construction of new road linkages which are necessary to support the current road network and the envisaged road network for the future. The interventions are applied to the road sections based on their priorities (based on the developed scoring criteria) and the annual budget. The transport infrastructure envisaged at the end of five years plan is for the development and maintenance of access road linkages and collector roads that maintains a road hierarchy (as formulated above) and justifies the construction and development of higher hierarchy roads in the medium and long term (in short term if justified).

As such, short term plan focuses on the accessibility of all the settlements, moving towards mobility to increase the access to wider services, thus paving the way for development of proper sustainable public transport services within and around the rural municipality. The strategy and

investment plans for short term municipality transport master plan is elaborated in the next section.

To improve accessibility, safety, and mobility in Sunilsmriti Rural Municipality over a five-year period, focusing on infrastructure enhancements, safety initiatives, and sustainable, low-cost transport solutions.

Road Infrastructure Upgrades

Year 1–2: Critical Route Paving and Graveling

- Identify and pave key sections of major routes connecting villages to essential services (e.g., schools, health posts, markets).
- Focus on high-traffic routes and roads prone to seasonal disruptions to improve reliability during the monsoon.

Year 3–4: Improve and Widen Key Pathways

- Widen and stabilize narrow paths to safely accommodate motorcycles and small vehicles.
- Create dedicated pedestrian pathways with gravel or stepping stones, especially on steep sections, to enhance safety for walkers.

Public Transport Development

Year 2–3: Launch Shared Transport Services

- Initiate a pilot for shared transport options (e.g., minibuses, shared jeeps) on key routes connecting major villages to central areas.
- Collaborate with local operators and provide incentives for affordable, reliable services.

Year 4–5: Expand Public Transport Coverage

- Assess demand from the pilot phase and expand to additional routes as needed, prioritizing underserved and remote areas.

Seasonal Maintenance and Resilience Measures

Annual Pre-Monsoon and Post-Monsoon Maintenance

- Allocate funds for regular road maintenance, particularly before and after the monsoon season.
- Implement erosion control measures like drainage channels and retaining walls to protect roads from landslides and flooding.

Year 1–5: Regular Clearing and Emergency Response Preparation

- Establish a local task force for landslide clearing and debris removal to ensure road accessibility during emergencies.

Safety Improvements and Awareness Programs

Year 1–2: Road Safety Campaign and Training

- Conduct safety training sessions for drivers, promoting safe driving practices.
- Install basic road signage, speed limit indicators, and pedestrian crossings along key routes.

Year 3–5: Safety Equipment Distribution

- Promote community-based safety education to instill a culture of road safety, especially for school children and vulnerable groups.

Institutional and Policy Support

Establish a Municipal Transport and Safety Committee (MTSC)

- Form a committee to oversee transport infrastructure, safety, and public transport operations, ensuring coordination and consistent policy implementation.

Seek Partnerships and Funding

- Collaborate with provincial and federal governments, as well as non-profits, for financial and technical support in road upgrades and safety programs.

Monitoring and Evaluation

Annual Progress Review

- Conduct an annual review to assess progress, gather feedback, and adjust the plan based on emerging needs and lessons learned.

Community Engagement

- Involve local residents in evaluations to ensure that transport initiatives align with their needs and are making a positive impact on mobility and accessibility.

This five-year plan will lay the foundation for a safer, more accessible, and efficient transportation system in Sunilsmriti Rural Municipality, leveraging affordable, practical improvements tailored to the rural municipality's unique challenges and opportunities.

4.7 MEDIUM TERM MUNICIPALITY TRANSPORT MASTER PLAN (TEN YEARS)

The development of the road network in medium term plan includes opening of the track and clearing the right of way (ROW) along the municipal roads. The period of short term plan controls the encroachment and urban sprawl growth along the ROW of the municipal roads.

Medium term and long term municipality transport plan gives the layout for the development of higher hierarchy road corridors with higher mobility and limited direct access. During the short term (first five years) development of local access roads and collector roads develops the concept and culture of wide roads among the locals. This facilitates in creating the demand for expansion of the roads to their designated class width during the medium term (five to ten years). Medium term plan continues the development and maintenance of the access roads and, expansion and maintenance of collector roads to their respective standard layout. Roads will also be constructed and expanded during the medium term plan depending upon the necessity/demand of road hierarchy.

All the roads of Class "B & C" will be constructed and maintained at their designated standard layout at the end of medium term plan. Class "B" and Class "A" roads will also be constructed wide enough to address the demand generated during this period. Class "C" roads will be constructed to their full width with designated pedestrian paths and tracks. The medium term time period will allow opening of the track by shifting the existing structures and stopping further construction of other structures within the designated ROW.

Road Infrastructure Development and Upgrading

Year 1–3: Expanded Paving and Graveling of Key Routes

- Pave additional high-use routes, focusing on major village connectors and roads that lead to health centers, schools, and markets.
- Prioritize resilient paving techniques suitable for hilly, erosion-prone terrain (e.g., use of concrete or durable gravel on steep slopes).

Year 4–6: Expand Road Network to Unconnected Areas

- Construct new roads to underserved or isolated areas, ensuring that all communities have year-round access to essential services.

Year 7–10: Widen Roads and Improve Slope Stability

- Gradually widen major roads to accommodate two-way traffic and improve roadside drainage.
- Add protective barriers and retaining walls along steep or landslide-prone sections to improve road durability and safety.

Public Transportation Expansion and Modernization

Year 1–3: Strengthen Shared Transport System

- Expand shared transport options (minibuses, shared jeeps) across additional routes, increasing frequency and coverage.
- Implement a regulated fare structure to keep services affordable for residents.

Year 4–6: Introduce Fixed Bus Routes on Main Roads

- Launch fixed-route bus services along main roads that connect population centers, creating a reliable backbone for public transportation.

Year 7–10: Establish Transport Hubs and Integrate Services

- Develop small transport hubs in key areas to facilitate transfers between buses, shared jeeps, and motorcycle taxis.
- Integrate services through synchronized schedules and unified ticketing systems to improve convenience and efficiency for commuters.

Road Maintenance and Climate Resilience Initiatives

Annual Road Maintenance Program

- Allocate budget for annual road maintenance, focusing on repairing wear-and-tear and managing erosion-prone areas.

Year 3–7: Install Climate-Resilient Infrastructure

- Install climate-resilient infrastructure such as enhanced drainage systems, flood barriers, and slope reinforcements on high-risk routes.

Year 5–10: Implement Green Infrastructure

- Use environmentally friendly materials and methods in road construction, such as permeable paving for better drainage.
- Add vegetation buffers along roadsides to minimize erosion and absorb rainfall, promoting long-term road stability.

Safety Improvements and Community Engagement

Year 1–3: Enhanced Safety Programs and Infrastructure

- Improve signage, install speed humps near schools and market areas, and introduce reflective road markings.

Year 4–6: Establish Community-Led Safety Programs

- Collaborate with schools and local organizations to create road safety clubs that educate children and the community on safe practices.

Year 7–10: Advanced Safety Features and Road Monitoring

- Add guardrails, emergency lay-bys, and pedestrian crossings in high-traffic areas.
- Set up periodic road audits to assess and improve safety measures based on data from accident reports and community feedback.

Alternative Transportation Modes and Infrastructure

Year 3–5: Promote Pedestrian Pathways

- Develop dedicated pathways for pedestrians along major routes, encouraging safe and active transportation options.

Year 6–10: Introduce E-Bike Rental Program

- Pilot an e-bike rental service for short-distance travel within the rural municipality, supporting low-cost, sustainable transportation.

Expand Non-Motorized Infrastructure

- Continue building walking trails and footbridges in areas where road construction is not feasible, maintaining accessibility to remote areas.

Institutional Capacity Building and Policy Implementation

Establish a Dedicated Transport and Infrastructure Office

- Set up a transport office within the rural municipality to oversee planning, maintenance, and public transport regulation.

Create Transport Policies Focused on Sustainability

- Formulate policies that prioritize eco-friendly practices in road construction and promote sustainable transport options.

Year 5–10: Pursue Regional and Provincial Partnerships

- Collaborate with regional authorities and seek funding from the provincial and federal governments to support large-scale infrastructure projects.

Economic and Social Development through Transport

Support Local Economic Growth with Transport-Linked Initiatives

- Develop “transport corridors” with small businesses, promoting economic activity along key routes.

Year 4–10: Increase Accessibility to Markets and Tourism Areas

- Improve roads leading to markets, tourist sites, and points of interest, positioning Sunilsmriti as a more accessible and attractive destination.

Monitoring, Evaluation, and Adaptive Planning

Annual Performance Assessments

- Conduct yearly evaluations of transport initiatives to ensure goals are being met, making adjustments based on emerging needs.

Community Feedback Mechanism

- Regularly gather input from residents through surveys and community meetings to understand transportation challenges and opportunities.

This ten-year master plan will transform Sunilsmriti's transportation landscape, improving infrastructure, enhancing public transport services, and ensuring that mobility solutions align with the rurL municipality's growth, safety needs, and sustainability goals.

4.8 LONG TERM MUNICIPALITY TRANSPORT MASTER PLAN (TWENTY YEARS)

The development of Class A & B roads is necessary in the long run of the rural municipality for the structured development of the road network hierarchy and thus the proper development of the trips and the municipality as a whole. The period of short term and medium term plan controls the encroachment and urban sprawl growth along the ROW of the Class "A" roads.

Long term municipality transport master plan envisages the development of the roads of all hierarchy within the municipality as depicted by the perspective plan whose demand is set out by the indicative potential development of the municipality.

Short term period (first five years) identifies the higher hierarchy roads necessary for the rural municipality in the long run and set necessary bylaws. It also implements those higher hierarchy roads in the policy level by controlling the development of other structures within the proposed ROW and shifting of the existing structure away. It will facilitate clearing of the ROW and track opening during the medium term time period (five to ten years). During medium term plan, these roads will be developed to certain level as per the existing demand.

This time period (first ten years) is critical in developing proper implementation policies, tools and plans for the construction and implementation of the standards of these roads in the long term time period of ten to twenty years. Plans to integrate other service facilities such as

electricity, drainage and drinking water pipes should be developed during this period. Other plans such as land use plan, city development plan (if not developed), drainage network master plan should be developed in compliance with the municipality transport master plan. Depending upon these plans, MTMP may also be revised. During the long term plan of ten years to twenty years, the higher hierarchy roads will be constructed in full phase.

The main objective of long term Master Plan is to establish a robust, sustainable, and inclusive transportation system over two decades, enhancing connectivity, resilience, safety, and economic opportunity for all residents of Sunilsmriti Rural Municipality.

Comprehensive Road Network and Paving Upgrades

Year 1–5: Pave Core Municipal Roads

- Fully pave the rural municipality's core roads to create a reliable, all-weather main transportation network connecting central hubs, villages, and service centers.

Year 6–10: Extend Paved Road Network to Secondary Routes

- Extend paving to secondary roads reaching smaller settlements and community centers, prioritizing areas where unpaved roads limit access.

Year 11–20: Construct and Maintain Peripheral and remote Roads

- Develop and maintain peripheral roads and mountain routes that link remote areas, ensuring each community has stable, year-round access.
- Include climate-resilient materials in paving and maintenance practices to extend road longevity and prevent seasonal disruptions.

Sustainable Public Transportation System

Year 1–5: Establish a Core Public Transport Network

- Develop a reliable public transport network using minibuses or shuttles on primary routes connecting village centers with markets, schools, and healthcare facilities.

Year 6–10: Expand Public Transport to Sub-Communities

- Expand coverage to include secondary routes, with increased service frequency on major routes during peak hours to reduce congestion and waiting times.

Year 11–20: Transition to Electric and Eco-Friendly Vehicles

- Introduce electric vehicles (EVs) into the municipal fleet, with subsidies or incentives for EV adoption by private and commercial transport providers.
- Set up EV charging stations at central points and public facilities to support a sustainable transition in line with national clean energy goals.

Enhanced Road Safety Infrastructure

Year 1–5: Implement Basic Safety Infrastructure

- Install safety signage, guardrails, speed bumps, and pedestrian crossings along main roads, particularly near schools, markets, and healthcare facilities.

Year 6–10: Advanced Safety and Monitoring Systems

- Introduce speed-monitoring systems, reflective road markings, and safety cameras in high-traffic or high-risk areas.
- Establish emergency response stations with first-aid kits, communication systems, and emergency equipment along key routes.

Year 11–20: Road Safety Education and Compliance Programs

- Conduct regular community education programs on road safety, targeting drivers, pedestrians, and schoolchildren.
- Implement strict safety regulations with municipal monitoring to reduce accidents and enhance compliance with road safety laws.

Climate Resilience and Infrastructure Development

Year 1–5: Initiate Basic Erosion Control and Drainage

- Build drainage systems along main roads to manage water flow during heavy rains, minimizing erosion and road damage.

Year 6–10: Climate-Proof Vulnerable Roads

- Introduce retaining walls, slope stabilization, and reinforced materials on steep or landslide-prone routes.
- Collaborate with environmental experts to implement green infrastructure, like bioengineering (e.g., vegetation planting) for natural soil retention.

Year 11–20: Advanced Climate Adaptation and Resilience Planning

- Build robust drainage, terracing, and retaining structures along all roads, particularly in mountainous areas, ensuring that the road network withstands extreme weather events.
- Invest in proactive climate monitoring technology to assess road vulnerabilities, directing maintenance funds to areas most at risk.

Development of Non-Motorized and Active Transport Infrastructure

Year 1–5: Construct Safe Pedestrian Paths

- Build dedicated pedestrian paths along major routes to encourage non-motorized transportation.

Year 6–10: Expand Active Transport Infrastructure in Village Centers

- Develop additional pathways and pedestrian zones in central hubs to reduce reliance on motorized transport for short distances.

Year 11–20: Create Green Transport Networks and Recreational Trails

- Construct scenic trails and pathways connecting local parks, cultural sites, and village centers, supporting active transport and local tourism.
- Promote non-motorized travel by establishing a network of safe, well-maintained routes for walking, cycling, and e-biking across the municipality.

Technological Integration and Smart Transport Solutions

Year 1–5: Basic Traffic and Mobility Data Collection

- Implement a data collection system to monitor traffic flow, road conditions, and transportation needs, aiding in data-driven decision-making.

Year 6–10: Digital Ticketing and Public Transport Scheduling

- Develop a digital system for ticketing and public transport scheduling, improving efficiency and convenience for residents.

Year 11–20: Smart Mobility Solutions and Real-Time Monitoring

- Install smart traffic management systems, GPS tracking for public vehicles, and real-time information systems at transport hubs.
- Establish an integrated transport management platform, allowing residents to access real-time schedules, traffic updates, and available transport options.

Economic and Social Integration of Transport Development

Year 1–5: Support Transport-Linked Economic Activities

- Create business zones along main roads, encouraging small businesses and services to support local economic growth.

Year 6–10: Facilitate Transport Access for Economic Growth

- Improve transport access to markets, business hubs, and tourist attractions, promoting economic development and entrepreneurship.

Year 11–20: Integrate Tourism and Cultural Sites into Transport Planning

- Create routes and trails leading to natural and cultural sites, improving tourism access and creating job opportunities in hospitality and guiding services.

Institutional Development and Capacity Building

Year 1–5: Establish a Transport and Infrastructure Office

- Form a dedicated office to oversee transport planning, infrastructure maintenance, and road safety regulations.

Year 6–10: Build Partnerships with Regional and National Stakeholders

- Develop partnerships with provincial and federal agencies to secure funding, technical assistance, and regulatory support for transport projects.

Year 11–20: Formulate Policies for Sustainable and Inclusive Transport

- Implement policies that emphasize environmental sustainability, road safety, and equal access to transport services across all communities.

Monitoring, Evaluation, and Adaptive Planning

Continuous Improvement and Adjustments

- Conduct biennial evaluations of all transport initiatives, collecting feedback from residents and adapting plans as needs evolve.

Community Engagement and Feedback Mechanisms

- Engage residents through surveys and town meetings, ensuring that transport initiatives address changing needs and continue to benefit all communities.

This twenty-year master plan provides a holistic and future-ready approach to transportation for Sunilsmriti Rural Municipality, combining infrastructure, public transport, active transport, and sustainability to create a connected, safe, and accessible environment for all residents.

CHAPTER 5: FORMULATION OF ROAD HIERARCHY

Roadways serve a variety of functions, including but not limited to the provision of direct access to properties, pedestrian paths, and bus routes and catering for through traffic that is not related to immediate land uses. Many roads serve more than one function and to varying degrees, but it is clear that the mixing of incompatible functions can lead to problems. Thus it is important to distinguish road in different class or type based on various criteria. A road hierarchy is a means of defining each roadway in terms of its function such that appropriate objectives for that roadway can be set and appropriate design criteria can be implemented. It is an important tool of road network and land use planning to asset management.

Road hierarchy restricts or reduces direct connections between certain types of links, for example residential streets and arterial roads, and allows connections between similar order streets (e.g. arterial to arterial) or between street types that are separated by one level in the hierarchy (e.g. arterial to highway and collector to arterial.) These hierarchical distinctions of road types become clearer when considering the recommended design specifications for the number of through lanes, design speed, intersection spacing and driveway access.

A well formed road hierarchy will reduce overall impact of traffic by concentrating longer distance flow onto routes in less sensitive locations, ensuring land uses and activities that are incompatible with traffic flow are restricted from routes where traffic movement should predominate and preserving areas where through traffic is discouraged.

The road hierarchy principles will assist planning agencies via orderly planning and provision of public transport routes, pedestrian routes. It also identifies the effects of development decisions in and on surrounding areas and roadways within the hierarchy and also facilitates urban design principles such as accessibility, connectivity, efficiency, amenity and safety. Further, it also identifies treatments such as barriers, buffers and landscaping to preserve amenity for adjacent land uses.

This study also formulates the road hierarchy for the various roads. After going through large number of literature, the study has proposed three level hierarchy roads namely Class A, B and C. Class C basically deals with access while Class A and B basically deals with mobility and accessibility to higher services.

Criteria	Class A	Class A & B	Class B	Class C
Purpose	Mobility	Mobility and control access	Access and mobility	Access

Criteria	Class A	Class A & B	Class B	Class C
Function	Through and long distance movement	Connection between Class A and C roads; and also Provide alternative connection routes between Class A	Connects higher order roads and mobility to local trips	Connect local trips to higher level roads
	High network coverage	Support through movement of traffic	Access to property	direct access to property
	Segregated NMT facilities and Bus lay bys	Segregated NMT facilities and Bus lay bys	Segregated NMT facilities	Local NMT movement
	Complete access to public transport	High access to Public transport	Limited access to public transport	
Maintenance Responsibility	Central & Provincial Government	Central, Provincial Government & Rural Municipality	Rural Municipality	Rural Municipality & Local people
Speed (Kmph)	Above 70	50-70	40-50	Below 40
Capacity (PCU/hr)	4000-4800	2400-3600	1500-2400	Less than 1500
Access Control	Full Control	Partial Control	Partial Control	No
Public transport services	Mass Transit facilities	Mass Transit, Local Public transport	Local Public transport	Local Public transport
Right of Way	12 m	12 m to 8 m	8 m	6 m

Table 6: Criterion of Road hierarchy

5.1 CLASS 'A' ROAD

All major roads which connect major Growth Centers (market, tourism Centre, industry, etc.) or several Wards with high network coverage, connected directly or through the National Strategic Road Network or district road falls on the road Class A. ROW for Class A road is 12 m, consisting a total carriageway of 7m having shoulder 1m each on both sides. Sidewalks for pedestrians are adopted 1.5m each on both sides with drains flowing below. Setback of 1.5m is adopted. List of Class A road is given below and the detail map is presented in Vol II. Typical cross section of Class 'A' road is as given in Figure 4 below and the detail is given in Vol II.

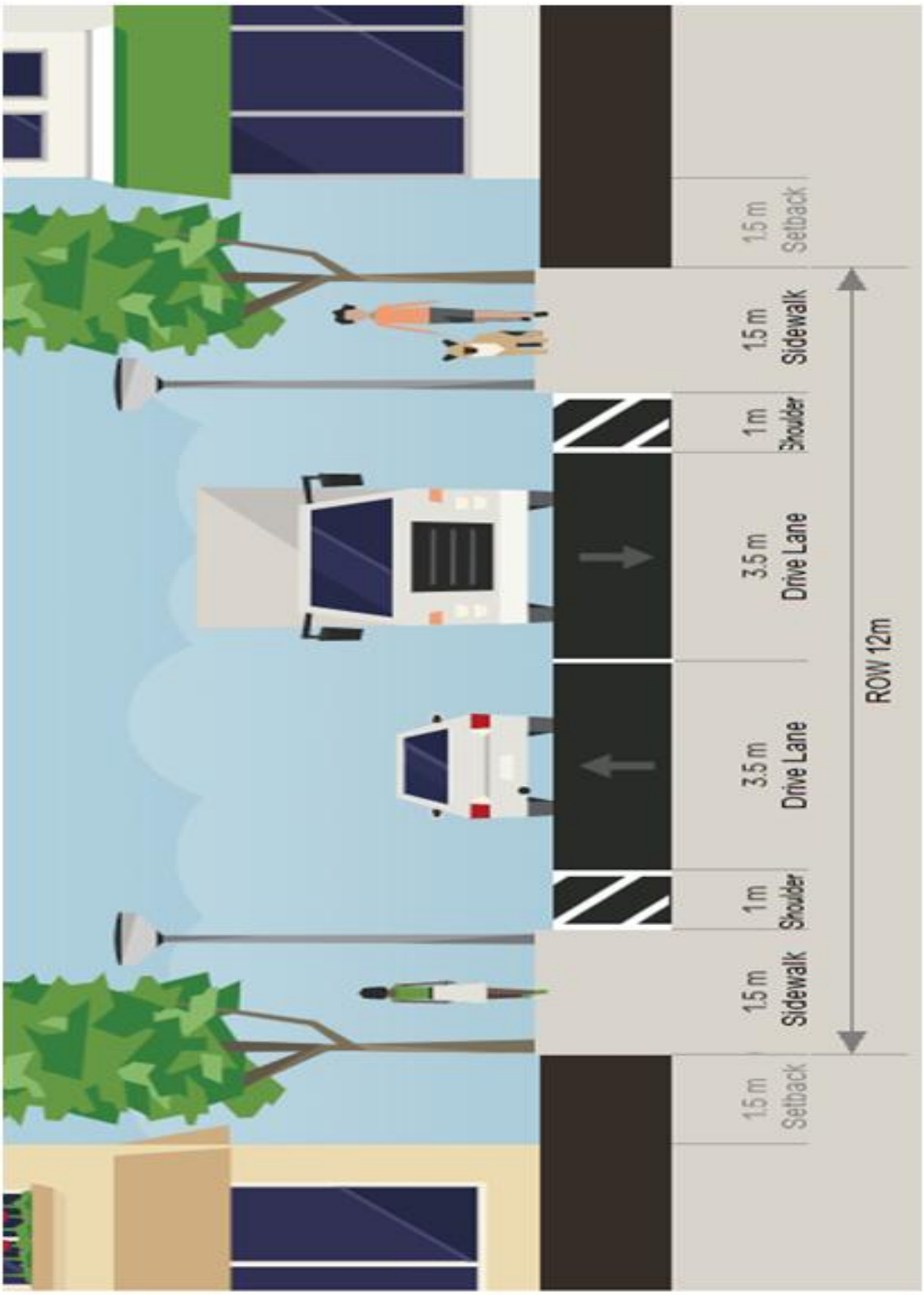


Figure 4: Cross section of a typical Class A Road

Road Code	Name	Category	Class	ROW (m)	Length (km)	Existing Width (m)	Carriageway Width (m)
53M8A001	Ghodagaun Tusarpani Dharampani Dang Sadak	Municipal Road	A	12	6.85	6	4
53M8A002	Sulichaur Jutung Khola Tebang Mainamare Sadak	Municipal Road	A	12	8.29	5	3.5
53M8A003	Shahid Marga	Municipal Road	A	12	17.49	5	3.5

Table 7: List of Class A Road

5.2 CLASS 'B' ROAD

All major roads which connect major Growth Centers (market, tourism Centre, industry, etc.) or several Wards with high network coverage, connected directly or through the National Strategic Road Network or district road falls on the road Class B. It provides access between Class A and class C roads. ROW for Class B road is 8m. A typical of 8m ROW has total carriageway width of 5.5m. Sidewalks for pedestrians are adopted 1.25m each on both sides with drains flowing below them. Setback of 1.5m is adopted.

List of Class B road is given below and the detail map is presented in Vol II. Typical cross section of Class B road is as given in Figure 5 below and the detail is given in Vol II.

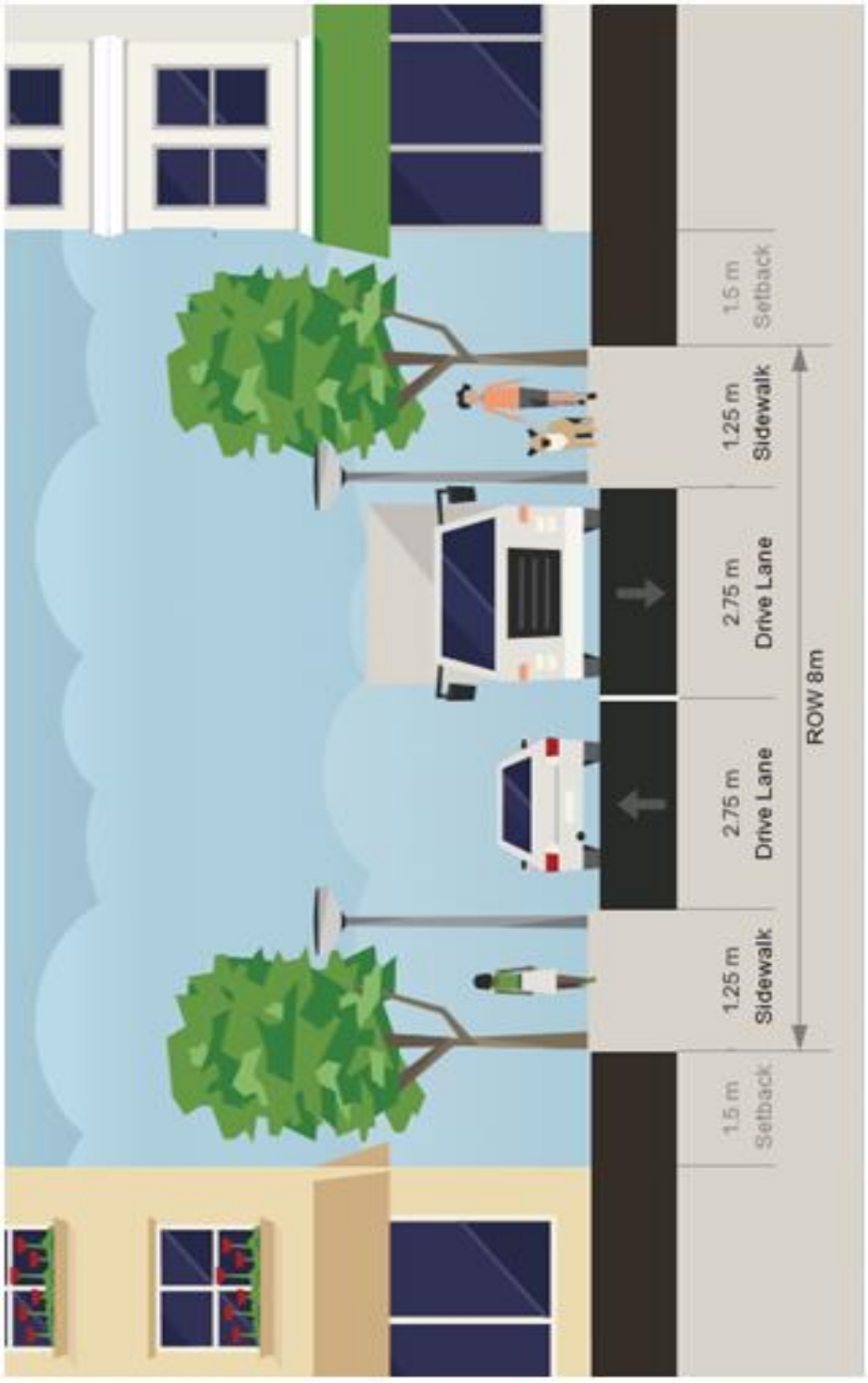


Figure 5: Cross section of a typical Class B Road

Road Code	Name	Category	Class	ROW (m)	Length (km)	Existing Width (m)	Carriageway Width (m)
53M8B001	Chhirni Koiralakharka Thalinjadhara Pyuthan Sadak	Municipal Road	B	8	14.92	5	4
53M8B002	Khungri Mahendri Harigaun Aanpchaur Sadak	Municipal Road	B	8	12.9	4	3.5
53M8B003	Sunil Marga	Municipal Road	B	8	4.98	4.5	4
53M8B004	Khungri Khungrikot Goganpani Khalsinge Satdobato Sadak	Municipal Road	B	8	12.92	4	3
53M8B005	Deukhurikhola Hile Goganpani Sadak	Municipal Road	B	8	10.46	4	3
53M8B006	Dharabang Thumpakilekh Dharampani Sadak	Municipal Road	B	8	7.65	4	3.5
53M8B007	Kulangkhola Panchikot Dharampani Sadak	Municipal Road	B	8	6.38	4	3.5
53M8B008	Bhanjekhola Poonghera Areshkhola Gurase Phuldhara Afale Sadak	Municipal Road	B	8	6.94	3	2.5
53M8B009	Bagma Koiralakharka Sadak	Municipal Road	B	8	6.02	4.5	3.5
53M8B010	Timlepokhara Gamaulibhir Gothibang Chispedhara Chimsikhola Sadak	Municipal Road	B	8	5.86	4	3
53M8B011	Aresh Areshkhola Dharakharkha	Municipal Road	B	8	5.56	3	2.5

Road Code	Name	Category	Class	ROW (m)	Length (km)	Existing Width (m)	Carriageway Width (m)
	Tewang Rajpokhari Sadak						
53M8B012	Arukharka Kakrebhir Todke Pyuthan Sadak	Municipal Road	B	8	5.36	3	2.5
53M8B013	Kahakhola Somdanda Areshkhola Tewang Chipchipe Patihalna Sadak	Municipal Road	B	8	4.87	3	2
53M8B014	Panchikot Urlikhola Thumpakilekh Sadak	Municipal Road	B	8	3.45	4.5	4
53M8B015	Rijha Kalipokhara Wadakaryalaya Sadak	Municipal Road	B	8	3.13	3.5	2.5
53M8B016	Pabang Dobata Harredhara Damkhola Rajpokhari Sadak	Municipal Road	B	8	5.76	2.5	2
53M8B017	Chiuribot Dharadanda Sadak	Municipal Road	B	8	1.33	4.5	4

Table 8: List of Class B Roads

5.3 CLASS 'C' ROAD

All roads which provide connection to higher order roads with individual household for mobility of local trips are understood as road Class C. For Sunilsmriti Rural Municipality, ROW of Class C is adopted 6m with immediate carriageway of 3.8m with shoulders of width 0.5 m provided on both sides. Walking pavements are provided on one side of width 1.2m with drain flowing below it. Setback of 1.5m is adopted..

List of class C road is given below and the detail map is presented in Vol II. Typical cross section of class 'C' road is as given in Figure 6 below and the detail is given in Vol II.

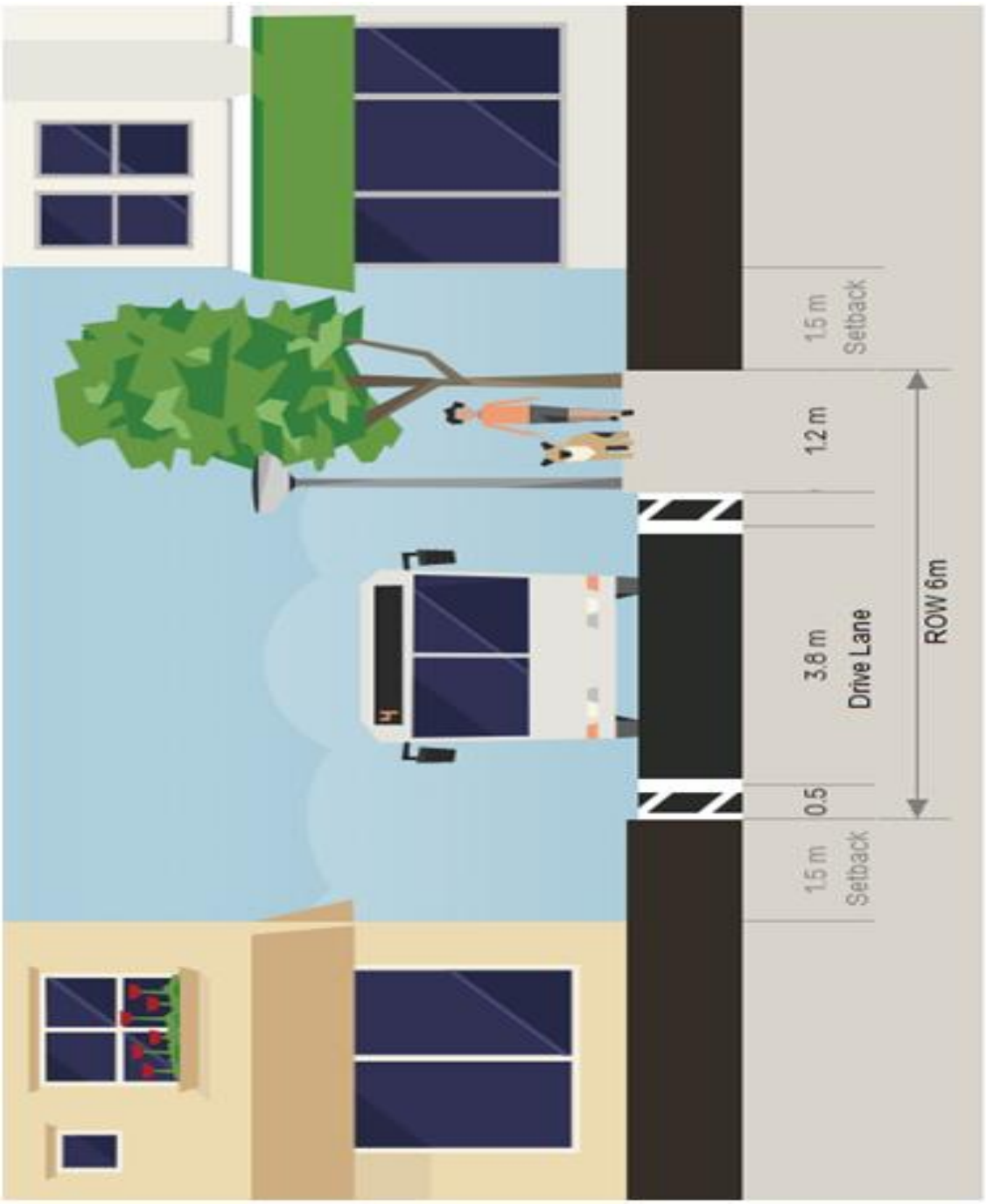


Figure 6: Cross section of a typical Class C Road

Road Code	Name	Category	Class	ROW (m)	Length (km)	Existing Width (m)	Carriageway Width (m)
53M8C001	Sulichaur Mijhing Nuwakot Sadak	Municipal Road	C	6	8.1	4	3.5
53M8C002	Khumelkhola Dhauligaun Nipani Sadak	Municipal Road	C	6	8.61	3.5	2.5

Road Code	Name	Category	Class	ROW (m)	Length (km)	Existing Width (m)	Carriageway Width (m)
53M8C003	Puranorijha Jhakrikholagaun Kalipokhari Ramkot Lungri Sadak	Municipal Road	C	6	8.22	3	2
53M8C004	Sulichaur Bazar Sadak	Municipal Road	C	6	0.58	3.5	2.5
53M8C005	Barahathan Sadak	Municipal Road	C	6	4.52	2.5	2
53M8C006	Daplang Harobang Serukharka Lampuja Sadak	Municipal Road	C	6	4.5	3.5	2.5
53M8C007	Dalanga Kaabhra Sadak	Municipal Road	C	6	4.3	3	2.5
53M8C008	Kherengkhola Sallepani Ghaderidhara Bhingripati Sadak	Municipal Road	C	6	4.62	3	2.5
53M8C009	Sasikhola Sanichaur Soda Dharapani Dhikfera Sadak	Municipal Road	C	6	4.19	3.5	3
53M8C010	Sarangdhara Barneta Ghodakot Sadak	Municipal Road	C	6	4.12	4	3.5
53M8C011	Chautaribari Dandagaun Mangha Ratamata Sadak	Municipal Road	C	6	5.38	3	2.5
53M8C012	Pedi Tintuk Obang Dhikur Sadak	Municipal Road	C	6	4.11	3.5	3
53M8C013	Chunaraga Chinne Arukharka Sadak	Municipal Road	C	6	3.9	3	2.5

Road Code	Name	Category	Class	ROW (m)	Length (km)	Existing Width (m)	Carriageway Width (m)
53M8C014	Qwaligaun Sulibang Dhungagadhe Lakasmara Sadak	Municipal Road	C	6	4.76	2.5	2
53M8C015	Laubang Tallokhara Sarekhola Sadak	Municipal Road	C	6	4.56	3.5	2.5
53M8C016	Mijhing Upallokharka Lampuja Sadak	Municipal Road	C	6	3.41	3.5	2.5
53M8C017	Laltibang Madichaur Khardanda Sadak	Municipal Road	C	6	3.36	3.5	3
53M8C018	Dhanmuda Bagma Sadak	Municipal Road	C	6	3.18	3.5	3
53M8C019	Pawang Dharachaur Sadak	Municipal Road	C	6	2.91	3.5	3
53M8C020	Lisne Aa Vi Afalepokhara Chuchevir Pyuthan Sadak	Municipal Road	C	6	2.83	3	2
53M8C021	Gajudhara Kharbang Sadak	Municipal Road	C	6	2.81	3	2.5
53M8C022	Khalsinge Harigaun Sadak	Municipal Road	C	6	2.79	0	0
53M8C023	Kakrebhir Kuwargare Lisnepani Akhale Gurase Sadak	Municipal Road	C	6	2.78	0	0
53M8C024	Dharadanda Healthpost Thapakhoriya Madikhola Sadak	Municipal Road	C	6	2.77	3.5	3
53M8C025	Thumpaki Timurkot Simkhola Sadak	Municipal Road	C	6	2.48	3.5	3

Road Code	Name	Category	Class	ROW (m)	Length (km)	Existing Width (m)	Carriageway Width (m)
53M8C026	Jaulipokhari Dharakharka Sadak	Municipal Road	C	6	2.24	3	2.5
53M8C027	Okhari Tapleghumti Lampatedera Laubang Sadak	Municipal Road	C	6	4.88	3	2.5
53M8C028	Simaldanda Sisnebang Righim Sadak	Municipal Road	C	6	3.86	0	0
53M8C029	Rolpaki Dera Jugena Sadak	Municipal Road	C	6	2.1	0	0
53M8C030	Sarangdhara Khadanda Dubring Gandarbabasti Sadak	Municipal Road	C	6	1.88	3	2.5
53M8C031	Chhirni Dhanmuda Bypass Sadak	Municipal Road	C	6	1.83	0	0
53M8C032	Harigaun Simle Lamachaur Sadak	Municipal Road	C	6	1.75	3	2
53M8C033	Mijhing Daibang Krishi Sadak	Municipal Road	C	6	1.72	3.5	2.5
53M8C034	Pipaltar Madikhola Sadak	Municipal Road	C	6	1.63	3	2.5
53M8C035	Patihalna Dhanmuda Sadak	Municipal Road	C	6	1.59	2.5	2
53M8C036	Chisapani Saunepani Chanighare Sadak	Municipal Road	C	6	2.95	3	2
53M8C037	Wardoffice Ghaudatole Pyandera Sadak	Municipal Road	C	6	1.87	2.5	2
53M8C038	Harobang Lek Lampuja Sadak	Municipal Road	C	6	1.5	3.5	2.5

Road Code	Name	Category	Class	ROW (m)	Length (km)	Existing Width (m)	Carriageway Width (m)
53M8C039	Beththala Wadakaryalaya Khungrichaur Sadak	Municipal Road	C	6	1.5	3.5	2.5
53M8C040	Kafalgaira Tebang Kolkhet Sadak	Municipal Road	C	6	1.47	3	2
53M8C041	Bhumithan Sirukharka Chinne Sadak	Municipal Road	C	6	2.55	3	2.5
53M8C042	Lekh Sisnekhola Chuchevir Sadak	Municipal Road	C	6	1.32	0	0
53M8C043	Mangha Dansibang Sadak	Municipal Road	C	6	1.27	2.5	2
53M8C044	Serpata Sanotopa Sallipipal Selari Sadak	Municipal Road	C	6	1.25	3.5	3
53M8C045	Rolpaki Dera Jugena Sadak	Municipal Road	C	6	1.23	2.5	2
53M8C046	Tusarpani Bardanda Sadak	Municipal Road	C	6	1.17	3	2
53M8C047	Katchera Dharabari Sadak	Municipal Road	C	6	1.11	2.5	2
53M8C048	Chatrabas Takura Barneta Sadak	Municipal Road	C	6	1.04	3	2.5
53M8C049	Banghar Kholadanda Sadak	Municipal Road	C	6	1.4	3	2.5
53M8C050	Bharatshyam Krishi Sadak	Municipal Road	C	6	0.97	0	0
53M8C051	Kharbang Sursibang Amilechaur Dobata Sadak	Municipal Road	C	6	1.21	2.5	2

Road Code	Name	Category	Class	ROW (m)	Length (km)	Existing Width (m)	Carriageway Width (m)
53M8C052	Ramche Mahadevsthal Bancharedanda Sadak	Municipal Road	C	6	1.5	3	2
53M8C053	Leka Urlikhola Upalobasti Sadak	Municipal Road	C	6	0.96	3	2.5
53M8C054	Madichaur Puritole Bhutiyachaur Sadak	Municipal Road	C	6	0.91	3	2.5
53M8C055	Sandop Mohara Devisthal Sadak	Municipal Road	C	6	1.27	3	2
53M8C056	Chiuribot Tallotole Thapakhoriya Healthpost Sadak	Municipal Road	C	6	0.87	4	3.5
53M8C057	Dhanakhola Devthan Sadak	Municipal Road	C	6	0.83	2.5	2
53M8C058	Kasimare Bhaganegufa Sadak	Municipal Road	C	6	1.22	3	2
53M8C059	Baubang Kumaldhara Sadak	Municipal Road	C	6	0.77	3	2.5
53M8C060	Harredhara Thamlek Sadak	Municipal Road	C	6	1.55	3	2
53M8C061	Shanti Batika Sadak	Municipal Road	C	6	0.75	2.5	2
53M8C062	Mahendri Sirantole Sadak	Municipal Road	C	6	0.74	3	2.5
53M8C063	Wardoffice Devghar Sadak	Municipal Road	C	6	0.72	2.5	2
53M8C064	Devisthan Daplang Sadak	Municipal Road	C	6	1.16	3	2
53M8C065	Rajpokhari Mandalithan Sadak	Municipal Road	C	6	0.6	2.5	2

Road Code	Name	Category	Class	ROW (m)	Length (km)	Existing Width (m)	Carriageway Width (m)
53M8C066	Bheditola Syaulechaur Healthpost Sadak	Municipal Road	C	6	0.51	3	2.5
53M8C067	Kaule Tallbhaisidhara Dadhinepokhara Sadak	Municipal Road	C	6	1.19	2.5	2
53M8C068	Pipaldhara Kalopahara Sadak	Municipal Road	C	6	0.47	3	2
53M8C069	Ratamata Damaidera Sadak	Municipal Road	C	6	0.45	3	2.5
53M8C070	Kabra School Sadak	Municipal Road	C	6	0.28	0	0
53M8C071	Khendre Kaabhradhik Sadak	Municipal Road	C	6	0.79	2.5	2
53M8C072	Padherakhola Thapatole Prabhatschool Sadak	Municipal Road	C	6	0.4	3	2.5
53M8C073	Lohareaanp Sanotapu Sadak	Municipal Road	C	6	0.39	3	2
53M8C074	Lohareaanp Takura Sadak	Municipal Road	C	6	0.39	3	2.5
53M8C075	Khungritole Mohan Kole Sadak	Municipal Road	C	6	0.38	3	2.5
53M8C076	Bhalabang Takura Sadak	Municipal Road	C	6	0.36	3	2.5

Table 9: List of Class C Roads

5.4 DISTRICT ROADS

District roads are classified as part of the rural road network managed by the District Coordination Committee (DCC) within each district. These roads connect rural areas to local service centers, municipalities, and the strategic (national) road network. District roads primarily

serve to connect smaller towns, villages, and rural communities within a district to facilitate local transport, accessibility, and economic activities.

District roads are crucial for rural accessibility, providing the primary means of transportation for goods, agricultural produce, and access to essential services like schools, health centers, and markets. District roads are funded through provincial government budgets, central funds, and sometimes by federal grants or donor agencies. Maintenance is often a challenge due to limited resources and the seasonal impact of monsoons.

In Sunilsmriti Rural Municipality, there are seven recognized District Roads presented in Table 11 below.

Code	Name	Type	Surface	ROW (m)	Length (km)
53DR019	Kimichaur Ghodagaun Laltibang Road	District Road	ER	20	6.31
53DR020	Kimichaur Ghodagaun Road	District Road	ER	20	2.92
53DR022	Lumpuja Gazulkot Road (Sunil Marga)	District Road	ER	20	16.87
53DR023	Runibang Phagam Road	District Road	ER	20	8.46
53DR025	Sulichaur Runibang Jaimakasala Phuliban Road	District Road	BT	20	0.79
			ER		5.26
53DR029	Sulichaur Tebang Lisne Pyuthan Sadak (Sahid Dharmabhakta Marg)	District Road	ER	20	16.81
53DR030	Sulichaur Aresh Pyuthan Sadak	District Road	BT	20	0.4
			ER		15.76

Table 10: List of District Roads

CHAPTER 6: FIVE YEARS MUNICIPAL TRANSPORT MASTER PLAN

This chapter explains the framework basis of preparation of master plan. The perspective plan of road network formed by different categories of road, financial institution for financing the projects and budget expenditure are elaborated in this chapter. This chapter concludes with plans to stage implementation.

6.1 STRATEGIC FRAMEWORK

The framework adopted during the entire planning and how it is compatible with long term vision of transportation planning and economic-social development is described in the underlying headings.

6.1.1 HIERARCHY OF ROADS

In any area, provision of proper hierarchy of roads at proper spacing helps to reduce traffic congestions and increase the mobility along the roads. A well-formed road hierarchy and its network of roads will reduce overall impact of traffic on the land use and at the same time guide the planned change of the land use. Thus, a proper hierarchy of road networks should be provided at proper spacing so that their purpose and functions can be justified.

Road hierarchies typically vary from one region or country to another, but there are some common elements across many systems. Here's a general hierarchy of roads often seen in many places:

The rural road network is essential for connecting small communities, enhancing accessibility to social services, and supporting local economies. In Nepal, the hierarchy and strategic framework for rural roads help guide their development, maintenance, and functionality, especially in remote areas like Sunilsmriti Rural Municipality. Below is a breakdown of the road hierarchy and strategic planning elements, defining the various rural road categories and their roles, along with a strategic framework that aligns with sustainable and inclusive transport development.

Hierarchy of Rural Roads

Village Roads (Local Access Roads)

Purpose: Village roads connect individual settlements, homes, and smaller localities within a village or ward to the nearest higher-class roads.

Characteristics:

- Often unpaved or earthen roads, designed for local and low-volume traffic.

- Primarily used for active transport modes (walking, biking) and light vehicles.

Role: Provide basic connectivity for households and allow residents access to village centers, water sources, schools, and other essential services.

District Roads (Feeder Roads)

Purpose: District roads link villages and rural settlements to service centers, markets, healthcare facilities, and municipal headquarters.

Characteristics:

- Usually a mix of paved, gravel, and unpaved roads depending on traffic demand and budget.
- Can accommodate both light and medium traffic, including public transportation where feasible.

Role: Facilitate movement between rural and urban areas, supporting economic activities like agriculture, small business, and market access.

Core Rural Roads (Primary and Secondary Rural Roads)

Purpose: Serve as the primary rural transport corridors, linking multiple villages or wards, and connecting rural areas with the strategic (national) road network.

Characteristics:

- Typically wider and more developed, with higher priority for paving and drainage systems.
- Designed for heavier traffic, including larger vehicles transporting goods to and from rural areas.

Role: Act as the backbone of rural mobility, facilitating trade, tourism, and access to external markets and services.

Within these categories, there can be further distinctions based on factors such as number of lanes, traffic volume, and functional classification. Additionally, some areas may have specific types of roads not covered by this general hierarchy, such as toll roads, parkways, or scenic byways.

Hierarchy should be maintained according to the major SRN road (national highway, feeder road) that passes through the municipality or is closest to the municipal area. Urban/municipal roads that open into these SRN should be have proper ROW and spacing so that the traffic that

enters the SRN is justified and the purpose of the road is also preserved. The NRS (2070) gives the provision of parallel service (frontage roads) at the spacing of at least 750 meters. Larger spacing creates bottlenecks while closer spacing may be unnecessary.

A well-formed network of Class "A" and "B" roads creates blocks of 1 sq. km. to 2 sq. km. in the urban area and bigger blocks in the sub-urban areas. The hierarchy also provides well connected pedestrian way.

6.1.2 URBANIZING ROADS

- Segregation of road users

Segregation of road users refers to the practice of separating different types of users on the road network to improve safety, efficiency, and convenience. This segregation can take several forms:

Physical Separation: Physical barriers such as medians, guardrails, or curbs can separate different types of road users. For example, separating pedestrian walkways from vehicular traffic or providing dedicated lanes alongside roads.

Designated Lanes: Designating specific lanes for particular types of vehicles or modes of transport helps segregate road users. This can include bus lanes, high-occupancy vehicle (HOV) lanes, or lanes designated for non-motorized vehicles.

Traffic Control Devices: Traffic signals, signs, and pavement markings can be used to segregate road users by controlling their movements at intersections and along roadways. For example, signalized crosswalks can provide pedestrians with dedicated time to cross safely.

Traffic Laws and Regulations: Laws and regulations can establish rules for different types of road users, defining their rights and responsibilities. For example, traffic laws may require motorists to yield to pedestrians at crosswalks or provide cyclists with a minimum passing distance.

Infrastructure Planning: Planning and transportation infrastructure design can incorporate features that prioritize specific modes of transport or encourage certain behaviors. For example, designing mixed-use developments with pedestrian-friendly amenities or creating interconnected bike networks.

Education and Outreach: Educating road users about safe practices and encouraging respectful behavior can help promote segregation on the roads. This includes campaigns to raise awareness about sharing the road, understanding traffic laws, and practicing defensive driving.

Roads are used by all sorts of users including pedestrians, cyclists, motorists and pubic vehicles. Their speed of travel varies significantly. Pedestrians and cyclists move slowly while other motorized vehicles travel at greater speed. Sharing of common roadway by all these users is very unsafe and unpleasant, especially for the active users. Their volumes are also very significant and thus cannot be ignored. Thus, adequate road infrastructure should be provided to ensure their safety by segregated pedestrian facilities and tracks. Such segregation can be achieved by level difference in those facilities and construction of green belt between the facilities.

Overall, segregation of road users aims to create a safer and more efficient transportation system by accommodating the diverse needs of different modes of transport while minimizing conflicts and improving overall mobility.

- Green Belt

Green belts in a road network typically refer to areas of vegetation or open space intentionally preserved or created alongside or between roads. Sunilsmriti is progressing towards urbanization. Urban area is characterized by dense population and high built up area. Unplanned urbanization has rendered many cities unlivable because of the growing pollution and lack of green/open spaces. Road space is most frequently used public space. Provision of green belt along the urban roads creates safer and pleasant walking spaces, and acts as median to separate motorists from each other and from the NMT users. It also reduces the road side air temperature and absorbs more pollutants generated from the motor vehicles on street than other distant trees. Green belts can absorb precipitation and reduce the size of required drainage. The trees also act as screen and results in attenuation of air, noise and light pollution alongside the urban roads. Thus, green belt between the motorists and NMT users and in the median strip is a compulsory infrastructure in the urban roads. Thus to avoid such unplanned situation, a propoer planning needs to be done now for Sunilsmriti Rural.

These green belts serve several purposes and offer various benefits:

Environmental Protection: Green belts help mitigate the environmental impacts of roads by providing habitat for wildlife, reducing air and noise pollution, and promoting biodiversity. They can also serve as natural corridors for wildlife movement.

Visual Enhancement: Well-designed green belts can enhance the aesthetic appeal of roadways, contributing to the beauty of the landscape and providing visual relief from the built environment.

Stormwater Management: Vegetation in green belts can help absorb and filter stormwater runoff, reducing the risk of flooding and improving water quality by trapping pollutants.

Recreation and Leisure: Green belts can provide opportunities for recreational activities such as walking, jogging, cycling, and picnicking, enhancing the quality of life for nearby residents and visitors.

Microclimate Regulation: Vegetation in green belts helps regulate microclimates by providing shade, reducing heat island effects, and moderating temperatures, thereby improving the comfort of road users and nearby communities.

Ecological Connectivity: Green belts can facilitate ecological connectivity by connecting fragmented habitats and providing wildlife corridors, supporting the movement of plants and animals and promoting genetic diversity.

Health and Well-being: Access to green spaces has been associated with various health benefits, including stress reduction, improved mental health, and increased physical activity.

In planning and transportation design, incorporating green belts into road networks requires thoughtful consideration of factors such as land use, ecological sensitivity, community needs, and infrastructure requirements. Effective integration of green belts can result in a more sustainable, resilient, and livable urban environment.

6.1.3 PUBLIC TRANSPORT

Public transport is a means for enhancing mobility of local people. High proportion of active transport users justifies the necessity of public transport to increase their mobility and thus access to wider services and facilities within the perceived travel time budget. Proper structured public transport routes are vital for sustainable transport development. The existing economy and travel pattern may not sustain on its own. Development of proper roads to facilitate access and (through access) mobility to various services and facilities will create more trips and thus demand. Strategic development of such roads will not only create demand for public transport (greater mobility) but also develop proper road network where public transport vehicles can ply.

As the demand increases, before well-structured and formal transport is justified economically, the local government should introduce municipal buses. Municipal buses are government run public vehicles. Their sole purpose is to provide greater mobility to the local people even when the demand is not economically justified. Such provision adds fuel to the overall development of the local economy. It also captures the potential public transport users and retains those users.

This is a "pull factor" to increase public transport users in the future and creates an environment to introduce formal public transport services.

Public transport plays a crucial role in modern societies, offering numerous benefits both for individuals and for the environment as a whole. Here are some of its importance and benefits:

Accessibility: Public transport provides mobility for people who do not have access to private vehicles or prefer not to use them, ensuring that everyone can reach essential services, employment opportunities, education, and recreational activities.

Cost-Effectiveness: Public transport is often more affordable than owning and maintaining a private vehicle, particularly in urban areas where parking fees, fuel costs, and vehicle maintenance expenses can be high.

Reduced Traffic Congestion: Public transport helps alleviate traffic congestion by taking multiple passengers in a single vehicle, reducing the number of cars on the road and easing traffic flow. This can lead to shorter travel times, fewer delays, and improved overall efficiency of the transportation network.

Environmental Sustainability: Compared to individual car trips, public transport produces fewer greenhouse gas emissions per passenger, contributing to air quality improvement and mitigating climate change. Additionally, public transport systems can be designed to use cleaner energy sources such as electricity or renewable fuels.

Energy Efficiency: Public transport is more energy-efficient than private vehicles on a per-passenger basis, requiring less energy per mile traveled. This efficiency is particularly significant in densely populated areas where public transport systems can achieve high ridership levels.

Land Use Efficiency: Public transport encourages compact, mixed-use development patterns that reduce urban sprawl and promote efficient land use. By concentrating development around transit hubs, public transport facilitates walking, cycling, and reduces the need for long-distance travel.

Social Inclusion: Public transport enhances social inclusion by providing transportation options for people with disabilities, older adults, low-income individuals, and other marginalized groups who may face barriers to mobility. Accessible public transport services help promote equity and ensure that everyone can participate fully in society.

Safety: Public transport is generally safer than individual car travel, with lower rates of accidents and fatalities per passenger mile. Public transport vehicles are often equipped with safety features such as seat belts, emergency exits, and onboard surveillance systems.

Economic Development: A well-functioning public transport system can stimulate economic development by connecting people to job centers, educational institutions, shopping areas, and other economic activities. It can also attract businesses and investment to areas served by transit infrastructure.

Overall, public transport plays a vital role in creating sustainable, inclusive, and vibrant communities, offering numerous benefits in terms of mobility, accessibility, environmental protection, and economic development. Investing in public transport infrastructure and promoting its use can contribute to a more efficient, equitable, and resilient transportation system.

6.1.4 PRINCIPLE GUIDELINE OF ROAD PLANNING

Change in land use and transport are cause and effect of each other, as depicted by the land use cycle in previous chapter. Thus, current land use and the predicted/planned change in land use in the future is the basic guideline for transport planning. Development of compact settlements and corresponding development scenario has been considered for road planning. The rural municipality is urbanizing area whose population is expected to rise in the coming years. As the population is added, the settlements grow both horizontally and vertically. Horizontal expansion increases the built up area while vertical expansion increases the population density. With higher road densities, the required width of the transport facilities also increases locally and along the major roads. Increase in built up area demands bigger network of local and collector roads which ultimately demand wider roads of higher hierarchy.

Road planning involves a set of principles and guidelines aimed at creating safe, efficient, and sustainable transportation networks. These principles help guide decision-making processes in road infrastructure development. Here are some key principles and guidelines of road planning:

Safety: Ensuring the safety of all road users is paramount in road planning. Design standards should prioritize measures to minimize the risk of accidents and injuries, such as appropriate lane widths, signage, lighting, pedestrian crossings, and traffic calming measures.

Accessibility: Roads should be designed to provide equitable access for all users, including pedestrians, cyclists, public transport users, motorists, and people with disabilities.

Planning should consider the needs of different user groups and provide appropriate infrastructure to facilitate their mobility.

Efficiency: Road networks should be designed to optimize the efficient movement of people and goods. This includes minimizing congestion, reducing travel times, optimizing traffic flow, and maximizing the capacity of existing infrastructure through measures such as intelligent transportation systems (ITS) and demand management strategies.

Sustainability: Road planning should promote environmental sustainability by minimizing the negative impacts of transportation on the environment. This includes reducing greenhouse gas emissions, minimizing land use and habitat destruction, promoting energy efficiency, and mitigating air and noise pollution.

Integration: Road planning should be integrated with other modes of transport, land use planning, and urban development strategies. Integrated planning ensures that road networks are part of a comprehensive transportation system that offers multiple options for mobility and supports sustainable urban growth.

Flexibility: Road planning should be flexible and adaptable to changing needs and conditions over time. This includes considering future growth projections, technological advancements, demographic changes, and evolving transportation trends when designing road infrastructure.

Community Engagement: Engaging stakeholders and the community in the road planning process is essential to ensure that infrastructure projects reflect local needs, preferences, and concerns. Public participation helps build support for projects, fosters transparency, and enhances the quality of decision-making.

Multi-modal Connectivity: Road planning should prioritize multi-modal connectivity by integrating roads with public transport systems, cycling networks, pedestrian pathways, and other modes of transport. This promotes seamless travel experiences and encourages sustainable travel choices.

Resilience: Road planning should consider resilience to natural disasters, extreme weather events, and other potential disruptions. Designing infrastructure to withstand and recover from such events helps ensure the continuity of transportation services and minimizes vulnerability to risks.

Cost-Effectiveness: Road planning should prioritize cost-effective solutions that optimize the use of resources and deliver maximum benefits to society. This includes conducting thorough

cost-benefit analyses, prioritizing investments based on the greatest societal impact, and exploring innovative financing mechanisms.

By adhering to these principles and guidelines, road planners can create transportation networks that meet the needs of society while promoting safety, accessibility, efficiency, and sustainability.

6.1.5 HIERARCHY OF SETTLEMENT

In transportation planning, the hierarchy of settlement and transportation refers to the organization and prioritization of different types of settlements and transportation infrastructure based on their size, function, and connectivity. This hierarchy helps guide decisions about where to invest in transportation infrastructure and services to support the efficient movement of people and goods within and between settlements of varying sizes. A proper hierarchy of settlement should be developed to segregate the commercial and business centers from settlement areas and industrial area. A hierarchy of the market centers should be developed as main market centre and local market centers. Promotion of bi-nuclear or multi-nuclear city is necessary for even development of the settlements within the municipality. These bring many services and facilities closer to the demand and reduce the need to travel to the main market centre. We can breakdown the hierarchy of settlements as:

Metropolitan Centers: These are large urban centers that serve as regional hubs for economic, cultural, and political activities. Metropolitan centers typically have dense populations, extensive transportation networks, and diverse land uses. Major cities and metropolitan areas fall into this category, and they require high-capacity transportation infrastructure such as highways, rail systems, and airports to support the movement of people and goods within the region and beyond. Sunilsmriti Rural Municipality will ultimately move towards being such Municipal Center.

Regional Centers: Regional centers are smaller urban areas that play important roles in their respective regions. They serve as secondary hubs for commerce, administration, and services, catering to surrounding communities and smaller settlements. Regional centers often have well-developed transportation networks, including highways, regional rail lines, and bus services, to facilitate connectivity with metropolitan centers and neighboring towns. Sunilsmriti Rural Municipality can currently be termed as being such Regional Center in the long run.

Suburban Communities: Suburban communities are residential areas located on the outskirts of metropolitan and regional centers. They offer a mix of housing types, commercial establishments, and recreational amenities, catering to residents who prefer a quieter lifestyle

while still having access to urban amenities. Suburban areas require transportation infrastructure such as local roads, collector streets, and public transit services to connect residents to employment centers, schools, and retail destinations within the region. Sunilsmriti is currently in this stage.

Small Towns and Rural Areas: Small towns and rural areas are characterized by low population densities, dispersed settlement patterns, and agricultural or natural landscapes. These areas often have limited transportation options, relying primarily on local roads, rural highways, and intercity bus services to connect residents to essential services and regional centers. Transportation planning in small towns and rural areas focuses on improving road safety, enhancing mobility for residents without access to private vehicles, and supporting economic development through improved connectivity.

By recognizing the hierarchy of settlement and transportation, investments in transportation infrastructure and services can be prioritized to effectively meet the mobility needs of diverse communities while promoting sustainable development, economic growth, and social equity across urban and rural areas.

6.1.6 INTRODUCTION OF BASIC ROAD AND ROAD SIDE INFRASTRUCTURE

There is a need to redefine the term “road way” among the local people who perceive only paved road surface for motorized vehicles as proper road way. Although, the proportion of active transport users is very high, the road infrastructure necessary to support these users do not fit within the defined road by the locals. Such perception and construction of road infrastructure accordingly will lead to high rate of motorization which creates problem to manage the generated traffic, pollution and other externalities.

In the present context, with very high active users, proper networks of pedestrian way and tracks should fit in the basic road width. It should be planned and implemented as basic road side infrastructure. Similarly, the landscaping of the road sections with proper greenbelt increases the greenery in the city, provides shade to the active users, segregate different users and a pleasant travelling environment for all the users.

Proper lay bys are necessary elements for proper public transport system. Bus stops should have proper sheltering furniture, seating benches, lighting system, trash boxes, information boards and displays of routes and schedule of buses and proper connected pedestrian ways and zebra crossings.

Intersections are major part of roads. Adequate design of sight distance, turning radius, islands, signs and signals need to be incorporated during early phase of construction of intersection.

We can discuss an overview of some key components:

Road Pavement: The road pavement forms the surface on which vehicles travel. It can be constructed using various materials such as asphalt, concrete, or gravel, depending on factors like traffic volume, climate, and available resources. Proper pavement maintenance is crucial to ensure smooth and durable road surfaces.

Road Markings and Signage: Road markings such as lane lines, arrows, and crosswalks, along with signage such as speed limit signs, directional signs, and warning signs, provide essential guidance and information to road users. Clear and visible markings and signage help improve safety and efficiency on the road.

Shoulders and Roadside Clearance: Shoulders are the areas adjacent to the travel lanes that provide space for emergency stopping, vehicle breakdowns, and pedestrian safety. Roadside clearance involves maintaining vegetation, ditches, and other features to ensure adequate visibility and minimize hazards along the road edge.

Guardrails and Barriers: Guardrails and barriers are installed along road edges and medians to protect vehicles from roadside hazards such as steep slopes, bodies of water, or obstacles. They help prevent vehicles from veering off the road and reduce the severity of collisions.

Roadside Lighting: Lighting along roads improves visibility during nighttime and adverse weather conditions, enhancing safety for drivers, pedestrians, and cyclists. Streetlights are typically installed at intersections, pedestrian crossings, and other critical locations to illuminate the roadway and surrounding areas.

Drainage Infrastructure: Drainage infrastructure, including culverts, ditches, and stormwater management systems, helps prevent water accumulation on road surfaces and adjacent areas. Proper drainage reduces the risk of flooding, erosion, and pavement deterioration, prolonging the lifespan of the road infrastructure.

Pedestrian Facilities: Sidewalks, crosswalks, pedestrian bridges, and pedestrian signals are essential for ensuring safe and accessible walking routes for pedestrians. Pedestrian facilities promote active transportation, reduce pedestrian-vehicle conflicts, and enhance connectivity within communities.

Bus Stops and Shelters: Bus stops equipped with shelters, seating, and signage provide convenient waiting areas for public transit users. Well-designed bus stops enhance the attractiveness and usability of public transportation, encouraging ridership and reducing reliance on private vehicles.

By introducing these basic road and roadside infrastructure elements, communities can create safer, more efficient, and accessible transportation networks that meet the needs of diverse road users while supporting economic development and quality of life.

6.1.7 ROAD DISCIPLINE

Road discipline refers to the adherence to traffic laws, regulations, and norms by all road users within urban areas. It encompasses behaviors and attitudes that contribute to the safe and efficient movement of vehicles, pedestrians, cyclists, and other users on urban roads. Obeying of proper discipline and enforcement of it is equally important as the provision of the urban road infrastructure itself. Proper discipline not only makes the use of the facility efficient, it also creates a sense of comfort and safety. Segregation of the pedestrian way and track from the main carriageway enforces certain level of discipline among the users. Provision of proper NMT crossing facilities and control of jay walkers is necessary to maintain proper flow of traffic in the Main Street and safety. Some key aspects of urban road discipline are:

Compliance with Traffic Laws: Urban road discipline requires motorists, cyclists, and pedestrians to obey traffic laws, including speed limits, traffic signals, lane markings, and pedestrian crossings. Following these laws helps maintain order and safety on the roads.

Respect for Right-of-Way: Road users must respect the right-of-way of others, yielding to pedestrians at crosswalks, giving way to vehicles when merging or changing lanes, and allowing emergency vehicles to pass. Respecting right-of-way rules prevents conflicts and reduces the risk of accidents.

Safe Driving Practices: Safe driving practices such as maintaining a safe following distance, signaling turns and lane changes, avoiding distractions (e.g., texting while driving), and adhering to designated speed limits are essential for urban road discipline. These practices help prevent collisions and ensure the safety of all road users.

Pedestrian Safety: Pedestrians should use designated crosswalks and pedestrian signals when crossing roads, obey traffic signals, and remain alert and visible to drivers. Drivers, in turn, must yield to pedestrians at intersections and crosswalks and exercise caution when approaching pedestrian-heavy areas such as schools or shopping districts.

Public Transit Etiquette: Users of public transit should queue in an orderly manner at bus stops or train stations, yield seats to those in need, and respect the authority of transit operators. Drivers should exercise caution when driving near buses and trams, yielding to them when they merge back into traffic and stopping behind them when they are picking up or dropping off passengers.

Enforcement and Education: Effective enforcement of traffic laws by law enforcement agencies helps deter unsafe behaviors and promote compliance with road rules. Additionally, public education campaigns and outreach efforts can raise awareness about the importance of urban road discipline and encourage responsible behavior among road users.

Overall, road discipline is essential for creating safe, efficient, and livable cities. By fostering a culture of respect, responsibility, and cooperation among all road users, cities can reduce traffic congestion, minimize accidents, and enhance the quality of life for residents and visitors alike.

6.1.8 INTEGRATED SERVICE PLANNING

Integrated road service planning involves the coordinated development and management of road infrastructure, transportation services, and related amenities to meet the diverse needs of communities while promoting sustainability, efficiency, and safety. Integrated service planning is a very important factor for damage minimization during construction and expansion of various facilities. As the road follows, settlement also expands which demands other facilities such as electricity, drainage and drinking water. All these facilities are provided along with road infrastructure, mostly within the ROW of road. Proper integration of these services with road planning is necessary to minimize multiple investments in the individual infrastructure and the damage to other infrastructure during maintenance and/or expansion.

The breakdown of key elements involved in integrated road service planning can be stated in following points as:

Multimodal Transportation: Integrated road service planning considers various modes of transportation, including roads, public transit (e.g., buses, trains), cycling infrastructure, pedestrian facilities, and emerging mobility options (e.g., ridesharing, micromobility). By accommodating multiple modes of transport, planners can create a balanced and efficient transportation network that offers diverse mobility options to residents and visitors.

Land Use Integration: Integrated road service planning integrates transportation planning with land use planning to promote compact, mixed-use development patterns that minimize the need for long-distance travel and support active transportation modes. By locating transportation

hubs, employment centers, residential areas, and amenities in close proximity, planners can reduce traffic congestion, improve access to essential services, and enhance overall urban livability.

Sustainable Infrastructure: Integrated road service planning prioritizes the development of sustainable transportation infrastructure that minimizes environmental impacts, reduces greenhouse gas emissions, and promotes resource efficiency. This may include investments in green infrastructure (e.g., permeable pavements, rain gardens) to manage stormwater runoff, the use of energy-efficient lighting and signaling systems, and the promotion of alternative fuels and electric vehicles.

Safety and Accessibility: Integrated road service planning emphasizes safety and accessibility for all road users, including pedestrians, cyclists, motorists, and public transit riders. This involves designing roads and streetscapes with features such as safe pedestrian crossings, dedicated bike lanes, accessible sidewalks, and traffic calming measures to reduce vehicle speeds and minimize the risk of accidents.

Community Engagement: Integrated road service planning engages stakeholders, residents, businesses, and advocacy groups in the planning process to ensure that transportation investments align with community priorities and reflect local needs and preferences. By soliciting input and fostering collaboration, planners can develop transportation solutions that are responsive to the unique characteristics and challenges of each community.

Data-Driven Decision-Making: Integrated road service planning relies on data and analysis to inform decision-making and evaluate the performance of transportation systems. This may involve collecting and analyzing data on traffic patterns, travel behavior, infrastructure conditions, and safety performance to identify areas for improvement and optimize resource allocation.

Resilience and Adaptation: Integrated road service planning considers the resilience of transportation infrastructure to climate change, natural disasters, and other disruptions. This may involve incorporating resilient design features (e.g., elevated roadways, flood-resistant materials) and implementing emergency response and evacuation plans to ensure continuity of transportation services during crises.

By integrating these elements into the planning process, integrated road service planning can create transportation systems that are efficient, equitable, and sustainable, meeting the needs of

communities today while ensuring resilience and adaptability for the challenges of tomorrow in Sunilsmriti Rural Municipality.

6.1.9 DEVELOPMENT PHASE OF ROADS

The proposed roads cannot be directly implemented at a glance. Proper phases of development of roads of all hierarchy should be envisaged and planned. The first phase is simply the formulation of necessary hierarchy and identification of road sections that serves/ can serve as different hierarchy roads. During this phase, bylaws as demanded by the formulated road hierarchy along the identified roads should be enforced. The next phase is to develop necessary policy and implementation plan for expansion and construction of the road. The phases of construction total road width should also be worked out as development of full road width as demanded by the respective road hierarchy may not be possible. As such, implementation of road hierarchy starts from roads in lowest hierarchy and stage wise expansion of the roads according to the demand and necessity of wider roads and facilities to the higher hierarchy roads.

The development phase of roads involves several stages, from initial planning and feasibility studies to design, construction, and maintenance. Here's an overview of the typical stages involved in the development of roads:

Planning and Feasibility Study: This initial stage involves identifying the need for new roads or improvements to existing ones. Planners assess factors such as population growth, traffic patterns, economic development goals, and environmental considerations to determine the feasibility and potential benefits of road projects.

Route Selection: Once the need for a road project is established, planners identify potential routes based on factors such as land use, terrain, environmental impact, cost, and community input. Route selection may involve conducting surveys, environmental assessments, and public consultations to evaluate various options and select the most suitable route.

Design: In the design phase, engineers and designers develop detailed plans and specifications for the road project. This includes determining the alignment, width, grade, and geometric features of the road, as well as designing intersections, bridges, drainage systems, and other infrastructure components. Design considerations also include safety features, accessibility, and compliance with applicable standards and regulations.

Environmental Assessment and Permitting: Environmental assessment studies are conducted to evaluate the potential environmental impacts of the road project and identify measures to mitigate adverse effects. This may involve assessing impacts on air and water

quality, wildlife habitats, cultural resources, and community aesthetics. Permits and approvals from regulatory agencies may be required before construction can begin.

Land Acquisition: In cases where new rights-of-way are needed or existing properties need to be acquired for road expansion, land acquisition processes are undertaken. This involves negotiating with property owners, appraising land values, and acquiring the necessary parcels through purchase or eminent domain proceedings.

Utilities Relocation: Before construction begins, existing utilities such as water lines, sewer systems, gas pipelines, and electrical cables may need to be relocated to accommodate the road project. Coordination with utility companies and municipalities is essential to minimize disruptions and ensure the timely completion of utility relocation work.

Construction: The construction phase involves the actual building of the road according to the approved plans and specifications. This includes earthwork, grading, pavement construction, installation of drainage systems, signage, and markings, as well as landscaping and restoration of disturbed areas. Construction activities are typically overseen by contractors, with project managers ensuring that work is completed safely, efficiently, and in compliance with contractual requirements.

Quality Control and Inspection: Throughout the construction process, quality control measures and inspections are conducted to monitor the quality of materials and workmanship, ensure compliance with specifications, and address any issues or deficiencies promptly. This may involve testing materials, conducting field inspections, and verifying that construction activities adhere to approved plans and standards.

Handover and Maintenance: Once construction is complete and the road is deemed ready for use, it is formally handed over to the appropriate authorities for maintenance and operation. Routine maintenance activities such as pothole repair, pavement resurfacing, signage replacement, and vegetation management are conducted to ensure the ongoing safety and usability of the road.

Monitoring and Evaluation: After the road is open to traffic, monitoring and evaluation efforts continue to assess its performance, identify any operational or safety issues, and implement corrective measures as needed. This may involve collecting data on traffic volumes, speeds, accident rates, and pavement conditions to inform future maintenance and improvement decisions.

Throughout the development phase of roads, collaboration among various stakeholders, including government agencies, municipality, contractors, utility providers, and community members, is essential to ensure successful project outcomes and the delivery of safe, efficient, and sustainable transportation infrastructure.

6.1.10 GRASS ROOT INSTITUTIONS

Creating a sustainable Municipal Transport Master Plan for Sunilsmriti Rural Municipality would require the involvement of various grassroots institutions to ensure that the plan reflects the needs and priorities of local communities. Grassroots institutions are community-based organizations, local government bodies, and other stakeholders at the grassroots level that play a crucial role in participatory planning processes. Here are some grassroots institutions that could be involved in creating the Municipal Transport Master Plan for Sunilsmriti Rural Municipality:

Community-Based Organizations (CBOs): CBOs represent the interests of specific communities or groups within Sunilsmriti Rural Municipality. They can provide valuable insights into the transportation needs and challenges faced by local residents, particularly marginalized or vulnerable populations. Examples of CBOs that could be involved include neighborhood associations, women's groups, youth clubs, and advocacy organizations.

Local Government Bodies: Local government institutions such as ward offices and municipal councils are key stakeholders in the planning and implementation of transportation projects. These institutions have intimate knowledge of local conditions, land use patterns, infrastructure priorities, and community preferences. Collaborating with local government bodies ensures that the Municipal Transport Master Plan aligns with broader development objectives and regulatory frameworks.

Transportation User Groups and Trade Unions: Engaging transportation user groups, including commuters, pedestrians, cyclists, and public transit riders, is essential for understanding their mobility needs and preferences. These groups can provide feedback on existing transportation services, identify gaps in the transportation network, and suggest improvements to enhance accessibility, safety, and affordability. Conducting focus group discussions, surveys, and public meetings with transportation user groups facilitates meaningful participation in the planning process. Transportation trade unions represent the interests of workers and operators within the transportation sector. Including them in the planning process ensures that the perspectives and concerns of these stakeholders are considered and addressed in the development of the Transport Master Plan. Transportation trade unions possess valuable expertise and experience related to the operation, management, and challenges of the

transportation system within Sunilsmriti Rural Municipality. Their input can provide insights into the current issues facing the sector and help identify opportunities for improvement.

Business Associations and Chambers of Commerce: Business associations and chambers of commerce represent the interests of local businesses and entrepreneurs in Sunilsmriti Rural Municipality. These organizations can offer valuable insights into the transportation requirements of commercial establishments, industrial zones, and trade corridors. Engaging with business associations helps identify opportunities for freight movement, logistics optimization, and economic development through improved transportation connectivity.

Educational Institutions: Schools, colleges, and universities in Sunilsmriti Rural Municipality play a vital role in shaping transportation demand and travel behavior. Engaging educational institutions in the planning process enables the identification of transportation challenges faced by students, faculty, and staff, as well as opportunities to promote sustainable transportation modes such as walking, cycling, and public transit. Educational institutions can also serve as research partners for data collection, analysis, and modeling activities related to transportation planning.

Non-Governmental Organizations (NGOs): NGOs working on issues related to transportation, urban development, environmental conservation, and social justice can contribute expertise, resources, and community networks to the planning process. These organizations often have grassroots connections and experience in participatory planning approaches that prioritize community engagement, equity, and sustainability. Collaborating with NGOs enhances the inclusiveness and effectiveness of the Municipal Transport Master Plan by incorporating diverse perspectives and fostering partnerships for implementation.

Community Leaders and Opinion Makers: Community leaders, religious leaders, opinion makers, and influential individuals in Sunilsmriti Rural Municipality play a significant role in shaping public opinion and mobilizing community support for transportation initiatives. Engaging with these stakeholders builds trust, fosters dialogue, and promotes ownership of the Municipal Transport Master Plan among local residents. Community leaders can also serve as advocates for transportation investments and policy reforms that benefit their constituents.

By involving grassroots institutions in the creation of the Municipal Transport Master Plan for Sunilsmriti Rural Municipality, planners can ensure that the plan reflects the needs, aspirations, and values of local communities, leading to more inclusive, equitable, and sustainable transportation outcomes.

6.1.11 LAND ACQUISITION

Land development and management should go parallel with clearance of RoW of higher classes of road. Road corridor development project should be introduced for acquisition of land required to clear RoW for various classes of road. Each road project requires to be individual project. The development project is aimed at minimizing social, financial and physical loss. The process of development needs to internalize the value created beyond the corridor as a result of corridor development in trickle down order. Generation and sales of sales plot can be enough to compensate for physical loss of building and account for social exclusion and rehabilitation. Moreover, the development project should be launched by the land owners committee rather than local government. To conduct feasibility study and advocate, Rs 10 lakhs has been apportioned to this sector from MTMP fund.

In the context of developing a Municipal Transport Master Plan for Sunilsmriti Rural Municipality, land acquisition may be necessary to accommodate transportation infrastructure improvements and expansions. Some points discussing land acquisition relates to the creation of the Transport Master Plan are as follows:

Road Widening and Expansion: As part of the Transport Master Plan, there may be proposals to widen existing roads or construct new roads to improve connectivity, reduce congestion, and enhance accessibility within the municipality. Land acquisition may be required to acquire additional right-of-way for road widening or to acquire land for new road alignments.

Construction of Transportation Facilities: The Transport Master Plan may include the construction of transportation facilities such as bus terminals, parking lots, transit stations, and pedestrian lanes. Land acquisition may be necessary to acquire suitable parcels of land for these facilities, taking into account factors such as accessibility, proximity to major roads, and compatibility with surrounding land uses.

Infrastructure Corridors: In some cases, the Transport Master Plan may propose the creation of infrastructure corridors for major transportation routes or modes of transport, such as dedicated bus lanes, light rail lines, or pedestrian pathways. Land acquisition may be required to assemble contiguous parcels of land along these corridors to accommodate the proposed infrastructure improvements.

Utility Relocation: Land acquisition may also be necessary to facilitate the relocation of utilities such as water lines, sewer systems, gas pipelines, and electrical cables to accommodate transportation infrastructure projects. This may involve acquiring easements or rights-of-way for utility corridors or underground conduits.

Community Consultation and Compensation: The process of land acquisition for transportation projects should involve meaningful consultation with affected landowners, residents, and stakeholders. Municipal authorities should engage in transparent and participatory processes to inform affected parties about the need for land acquisition, assess potential impacts, and provide fair compensation for land and property acquired.

Environmental Considerations: Land acquisition for transportation projects should take into account environmental considerations such as habitat conservation, water quality protection, and cultural heritage preservation. Environmental assessments should be conducted to identify potential impacts of land acquisition and mitigate adverse effects through appropriate planning and design measures.

Legal and Regulatory Compliance: Municipal authorities must comply with legal and regulatory requirements governing land acquisition, including land acquisition laws, zoning regulations, environmental regulations, and procedures for public consultation and compensation. Proper documentation and adherence to due process are essential to ensure the legality and legitimacy of land acquisition activities.

By integrating land acquisition considerations into the planning process for the Municipal Transport Master Plan, Sunilsmriti Rural Municipality can effectively address the infrastructure needs of the community while minimizing negative impacts on affected stakeholders and the environment. Transparent and inclusive processes for land acquisition can help build trust, support, and cooperation among all parties involved in implementing the Transport Master Plan.

6.2 PERSPECTIVE PLAN OF MUNICIPAL ROAD NETWORK

Perspective plan of municipal road network includes the maintenance of the access and collector roads and development of higher hierarchy road corridors supporting mobility of the roads. First five years should focus on development of existing access roads and their maintenance. It also incorporates construction of new road linkages to provide basic access to the settlements. Roads of Class “C” will also be widened to its functional width providing proper tracks and pedestrian ways where permitted by the available road space. During this period formulated road hierarchy will be implemented in terms of policy and enforcement of bylaws. Within 2 years other complementary plans of land use and city development will be developed. In the third year, the MTMP and its perspective plan should be revised in coordination with the other plans formulated and changes captured during this period.

Year five to ten will then implement the higher hierarchy roads in stages of clearing of the required ROW road space and construction of necessary infrastructure. Proper development stages of roads should be planned (construction of Class "A & B" roads to the standards, then gradually upgrading to Class "B" and then to Class "A"). Other implementation strategies should also be developed and finalized at the end of this period. The road network developed during this period shall complete construction of Class "C" roads. This will demand higher class roads to support the local road networks. Gradual upgrading of the higher hierarchy road networks during year ten to twenty will be justified by the traffic generated and level of mobility demanded to support the emerging economy. The total cost for the required interventions proposed for all the municipal roads and to upgrade all of them (MTPP Cost) is calculated based on the rates of ToR and was found to be approximately **NRs. 5,209,459,656 (Five Billion Two Hundred Nine Million Four Hundred Fifty Nine Thousand Six hundred and Fifty Six only)**

6.3 FINANCIAL INSTITUTION AND CAPITAL INVESTMENT PLAN

To determine how much of the proposed work can be carried out in the 5-year MTMP period, it is necessary to estimate the budget available in this period. This is done by estimating the amount of money available from different sources based on the actual amounts of the current or last financial year, assuming certain growth rates for each funding source.

Firstly, the total budget for the current or last financial year needs to be determined. This information needs to be obtained from the municipality account and planning section or the Annual Budget Book published by the rural municipality, indicating the different sources of funding and the amount of funding from each source allocated to the road sector. Sources of funding should be clarified as much as possible to avoid confusion and duplication. In writing up the budget of the last financial year, the wording of the funding sources below should be used to facilitate understanding and comparison with other municipalities. Additional funding sources may be included where relevant.

Planning of the investment is essential to support local government in developing good and best practice in construction, upgrading, overall asset management and especially operation and maintenance the road project. Most of local governments in Nepal have accounting systems that are not capable to meet today's requirements, and it is assumed that there are growing differences between public and private sector accounting policies and practices. The poor standards in public sector accounting do have multiple consequences, most obvious in the area of auditing and accountability. It is recommended that the planning section of municipality should incorporate funding source from different line agencies as well as NGOs, INGOs, people's contribution fund

for proper management, infrastructure development and maintenance of road within the municipality.

In developing a Municipal Transport Master Plan for Sunilsmriti Rural Municipality, financial institutions and capital investment play critical roles in funding and implementing transportation infrastructure projects. Here's how financial institutions and capital investment plans can be related to the development of the Master Plan:

Project Financing: Financial institutions such as banks, development banks, and international funding agencies can provide financing for transportation infrastructure projects outlined in the Master Plan. These institutions may offer loans, grants, or other forms of financial assistance to support the construction, expansion, or improvement of roads, public transit systems, and other transportation facilities.

Public-Private Partnerships (PPPs): PPPs involve collaboration between public sector entities and private investors to develop and operate transportation infrastructure projects. Financial institutions can facilitate PPP arrangements by providing project financing, risk management services, and expertise in structuring and negotiating PPP contracts. PPPs can help mobilize private capital and expertise to supplement public funding for transportation projects.

Capital Investment Planning: Capital investment planning involves identifying and prioritizing transportation infrastructure projects based on their expected benefits, costs, and funding availability. The Transport Master Plan serves as a blueprint for capital investment planning by outlining the municipality's long-term transportation goals and identifying priority projects that require funding. Financial institutions can assist in assessing project feasibility, estimating costs, and developing financing strategies to support capital investment planning efforts.

Budgeting and Resource Allocation: Municipalities allocate financial resources to transportation projects through annual budgeting processes. Financial institutions can provide guidance on budgeting practices, revenue generation strategies, and fiscal management to ensure the effective allocation of resources for implementing the Transport Master Plan. This may involve advising on revenue streams such as fuel taxes, vehicle registration fees, tolls, and public transit fares to fund transportation projects.

Grant Funding and Subsidies: Financial institutions may administer grant programs or subsidies to support transportation infrastructure projects that align with policy objectives such as reducing traffic congestion, improving air quality, or promoting sustainable mobility.

Municipalities can leverage grant funding opportunities provided by financial institutions and government agencies to supplement their own resources and accelerate the implementation of the Transport Master Plan.

Debt Financing: Municipalities may use debt financing instruments such as bonds or municipal bonds to raise capital for transportation infrastructure investments. Financial institutions can underwrite bond issuances, arrange debt financing, and provide advisory services to municipalities seeking to raise funds through debt markets. Debt financing allows municipalities to spread the cost of infrastructure projects over time and access larger amounts of capital upfront.

Risk Management: Financial institutions can assist municipalities in managing financial risks associated with transportation projects, such as cost overruns, revenue shortfalls, and project delays. This may involve providing financial derivatives, insurance products, or hedging strategies to mitigate risks and ensure the financial sustainability of the Transport Master Plan.

By collaborating with financial institutions and developing a capital investment plan aligned with the goals of the Municipal Transport Master Plan, Sunilsmriti Rural Municipality can secure the necessary funding and resources to implement transportation infrastructure projects that improve mobility, enhance connectivity, and support sustainable urban development.

6.4 FIVE YEAR BUDGET EXPENDITURE

One of the final outcomes of this study is to provide annual budget expenditure for proposed intervention (new construction, upgrading, maintenance and rehabilitation).

For the allocation of yearly budget, the total cost required for five years is first calculated and this amount is distributed to yearly assuming that budget spending capacity of municipality is expected to grow at the rate of 10% per year. Total budget required for the 5 years (MTMP Cost) was found to be approximately **NRs. 119,134,921 (One Hundred Nineteen Million One Hundred Thirty Four Thousand Nine Hundred and Twenty One rupees)**. During this span of five years, 3.87 km roads will be blacktopped which will include Class A roads.

The estimate of budget required for the five years is prepared based on the assumption that the Class A & B road is to be made two lane, Class C road is to be made single lane and lane considered are assumed to be metalled. Due to limitation of budget, the roads are assumed to have simple cross drainage structures within this period whereas cross drainage structures such as Bridges are not included in this budget and expected to be completed within this time period by external sources. For approximate costing, the construction rate of road appurtenances is

assumed to be equal to that of gravelling cost and for short term the minimum width of 4m is assumed if existing road width doesn't exists.

MTMP mainly deals with Class A and B roads, and it may found that Class C roads are not given any consideration. Interventions on those roads need to be incorporated in annual budget plan. Intervention that need can't be completed in predetermined year should be the next priority in coming year. If a certain road, which was targeted to complete in first year could not be finished in first year, need to be given first priority in next year expenditure plan. If there is deficit in annual expenditure, municipality needs to incorporate that particular heading in next year at any cost. They can look for grant, assistance from province or even central level or they can incorporate them by shifting budget from less importance item/heading.

Total budget is first broken down to 70% for road construction and 30% for maintenance. Of the total budget available for construction of roads, 40% is allocated for construction of class A roads, 30% is allocated for Class B and remaining 30% is allocated to Class C roads. It is however necessary to establish a relation in accordance to the availability of roads for upgradation purpose. If all the roads in the higher classes are already constructed, the budget allocated automatically gets moved down to the lower class roads. So, establishing a definite pattern in expenditure of budget may not always follow the allocation mentioned above.

Maintenance cost has been allocated 30% of fund available for municipal road. Yearly maintenance plans according to need based assessment of required maintenance has to be prepared and cost allocation needs to be done through this plan. Rs 10 lakhs required for advocacy and promotion of higher classes of road for clearance of RoW through land development and land pooling projects is allocated from budget available for maintenance. These projects of road corridor development should be conducted by directly involving local people. In absence of specific fund granted for special project, all other fund available to municipality for construction of road should come through one window system collected in under single basket and allocated to the roads based on ranking of roads.

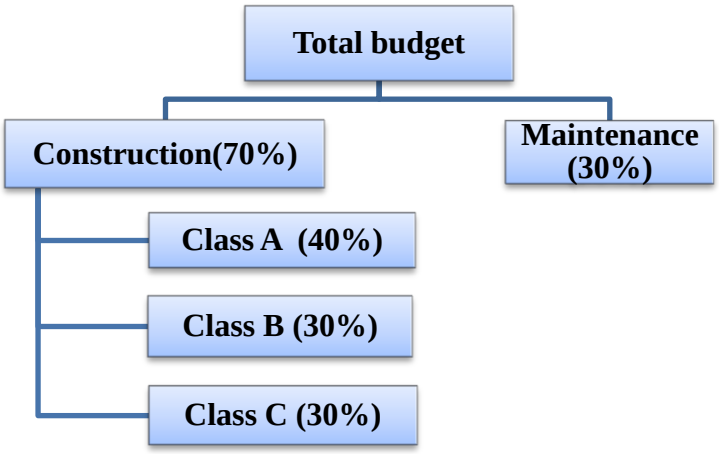
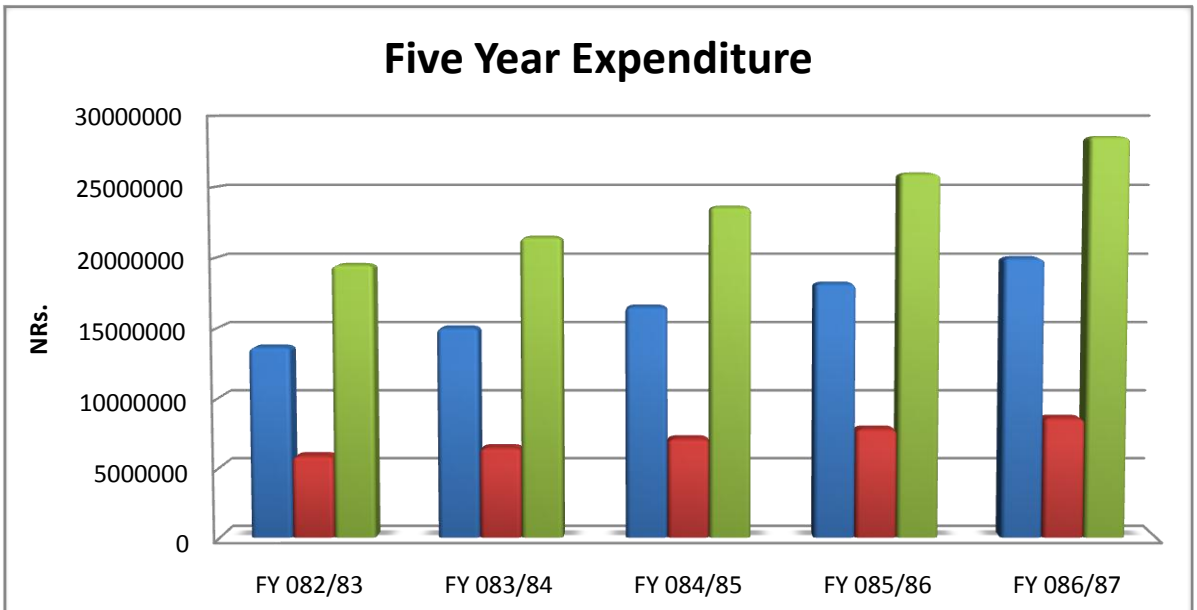


Figure 7: Tentative Budget Allocation depending on Road Class

The total budget allocated for road and allied infrastructures in Sunilsmriti Rural Municipality for the FY 2081/82 was NRs. 17,740,000 (Seventeen Million Seven Hundred Forty Thousand) for road infrastructure development. Taking into consideration 10% increase in infrastructure budget will be allotted for road and allied structure for FY 81/82, we have prepared a five year budget as presented in chart below. The total MTMP cost for five years was found to be **NRs. 119,134,921 (One Hundred Nineteen Million One Hundred Thirty Four Thousand Nine Hundred and Twenty One)**



	FY 082/83	FY 083/84	FY 084/85	FY 085/86	FY 086/87
Construction	13659800	15025780	16528358	18181193.8	19999313.18
Mantainance	5854200	6439620	7083582	7791940.2	8571134.22
Total	19514000	21465400	23611940	25973134	28570447.4

Chart 17: Five Year Budget Expenditure

6.5 SCORING CRITERIA AND PRIORITIES

A network consists of several links. It is not possible to construct all roads at a time due to resource and time constraint. Therefore, each link in a network needs to be prioritized and various interventions need to be taken based on the prioritization. After developing a municipal level road network, the cost estimate of the road is prepared and benefit of each link in the network is assessed. There might be various criteria of prioritization, which may differ from place to place The basic criteria that is used for prioritization includes existing population within the zone of influence, present road demand, future potential route, accessibility situation, land use pattern, proximity to the market/service centers, religious and tourism places, existing road width and surface type. These criteria are given various weight age and weight age average of all the criteria is summed up to come with a priority of intervention. All type of intervention is provided with same scoring criteria. The finalized scoring criterion based on rigorous study is set in front of municipality and MRCC for its approval.

Each road link is allocated the number of points corresponding to the fulfillment of the particular criteria. The weighted average of score that each intervention receives leads to a ranking/prioritization of the intervention options. Short description of the indicators used is given below and detail discussion is given in Annex II of the report.

- **Demand priority of wards** indicates higher the priority order of the road by ward, higher the weight age the road gains.
- **Proposed road class:** higher the road class, higher number of people it serves and it should get more priority.
- **Total existing width:** the road with more width should get higher priority because it indicates the necessity of road and the people's dedication for wide roads.
- **Population served:** the main purpose of the road is to serve people and more a road serves for population it should be given high priority.
- **Road surface condition:** from the point of view of accessibility to mobility, more priority should be given to road of poor surface condition to upgrade to higher condition.
- **Road density:** it may be defined in two ways. In one way it is the length of road per unit area of the settlement and in another way it indicates the length of road per 1000 population it serve.
- **Settlement density:** higher the settlement density, higher will be the road users and hence such area should be given more priority.

- **Service provided by the road such as Recreational(R), Agricultural (A), Market (M) and Service centre(S) (RAMS):** if a road provides more service than another then this road should be given higher priority.
- **Access to poor and minor:** if a road serves for poor and marginalized people then it should be given higher priority.

6.6 STAGING IMPLEMENTATION

The staging implementation of the Municipal Transportation Master Plan for Sunilsmriti Rural Municipality involves a phased approach to prioritize, implement, and monitor transportation projects over time. This approach ensures that resources are allocated efficiently, and actions are tailored to meet the evolving needs of the community. The staging implementation encompasses mid-period reviews, yearly maintenance plans, and stages of development for roads to ensure the successful execution of the Master Plan.

Mid period review

The mid-period review serves as a crucial checkpoint to assess progress, identify challenges, and make adjustments to the Municipal Transportation Master Plan. This review typically occurs midway through the implementation period and involves the following steps:

Evaluation of Progress: An assessment is conducted to evaluate the progress made in implementing transportation projects outlined in the Master Plan. Key performance indicators, such as project completion rates, budget utilization, and achievement of milestones, are analyzed to measure progress against established targets.

Stakeholder Consultation: Stakeholder engagement sessions are held to gather feedback from municipal authorities, transportation agencies, community representatives, and other stakeholders involved in the implementation process. These consultations provide an opportunity to identify emerging issues, address concerns, and garner support for ongoing initiatives.

Adjustment of Strategies: Based on the findings of the mid-period review, strategies and action plans are adjusted as needed to overcome challenges, seize opportunities, and ensure alignment with evolving priorities. This may involve reprioritizing projects, reallocating resources, or modifying timelines to optimize the effectiveness of the Master Plan.

Documentation and Reporting: The outcomes of the mid-period review, including findings, recommendations, and revised action plans, are documented in a comprehensive report. This report serves as a reference for decision-makers and stakeholders and informs subsequent stages of the implementation process.

In light of present context without proper land use and city development plans of the municipality, the formulated municipal transport plan for five years and long term perspective plan cannot be complete. Comprehensive drainage plan and layout also guides the placement of cross drainage structures along the roads. Therefore, a mid period review is necessary. This review follows the formulation of comprehensive city development plan and land use plan. These plans will bolster the transport master plan and also suggest necessary deviations and revisions. The surveys conducted to prepare this MTMP are baseline survey for future planning. In reference to these surveys, the mid period review will track the changes and its effect on the formulated five year plan and long term perspective plan. Based on the recommendations of land use and city development plan, and the changes during the first two years in the road infrastructure and road traffic the mid period review will guide MTMP in the later stages.

The next MTMP will be prepared in the sixth year which will create a void in continuity of transport infrastructure development during the sixth year. The mid period year shall also formulate implementation and investment plan for that period which will be carried over the next MTMP.

Yearly maintenance plan

According to the yearly progress of transport infrastructure development and construction, yearly maintenance plan should be prepared. This maintenance plan addresses the recurrent maintenance, specific maintenance and emergency maintenance requirements of the municipal roads.

The yearly maintenance plan outlines activities and resources needed to preserve, repair, and enhance the transportation infrastructure within Sunilsmriti Rural Municipality. This plan is developed annually and includes the following components:

Routine Maintenance: Regular maintenance activities, such as road sweeping, pothole repair, signage replacement, and vegetation management, are scheduled to ensure the safety and usability of the road network.

Preventive Maintenance: Preventive measures, such as pavement sealing, crack sealing, and drainage system cleaning, are implemented to extend the lifespan of transportation infrastructure and minimize the need for costly repairs.

Budget Allocation: Financial resources are allocated to support maintenance activities, including labor costs, equipment procurement, material supplies, and contract services. Budget

allocations are based on the priorities identified in the Master Plan and the recommendations of the mid-period review.

Performance Monitoring: Progress on maintenance activities is monitored regularly to assess the effectiveness of interventions, track expenditures, and address any deviations from the planned schedule. Performance indicators, such as road condition assessments and maintenance work orders, are used to evaluate the impact of maintenance efforts on the overall condition of the transportation network.

Stages of development of roads

Visualization of stages of development of roads is very important aspect of long term municipality transport master plan (perspective plan). Current land use and road side development may not allow immediate implementation of wider roads. These restrictions should be addressed in various stages. The stages can be visualized in reference to various variables.

The development of roads within Sunilsmriti Rural Municipality is staged to prioritize investments, sequence projects, and manage resources efficiently. The stages of development for roads include the following:

Stage 1: Identification and Prioritization: Roads are identified and prioritized based on criteria such as traffic volume, connectivity, economic significance, and community needs. Stakeholder input and technical analysis are used to select projects that align with the objectives of the Master Plan and address the most pressing transportation challenges.

Stage 2: Planning and Design: Once roads are identified for development, detailed planning and design activities are undertaken to define project scope, alignment, right-of-way requirements, and design standards. Environmental assessments, land acquisition processes, and utility coordination efforts are initiated to prepare for construction.

Stage 3: Construction and Implementation: With plans finalized and approvals obtained, construction activities commence to build or upgrade the identified roads. Construction works are executed according to established timelines, budgets, and quality standards, with oversight from project managers and engineers to ensure compliance with specifications and safety regulations.

Stage 4: Monitoring and Evaluation: Upon completion of construction, the newly developed roads are monitored and evaluated to assess their performance, functionality, and impact on the transportation network. Feedback from users, field inspections, and performance metrics are used to identify lessons learned and inform future road development initiatives.

The prime stage is the formulation of policy and plans. This stage formulates the hierarchy and their geometric and physical characteristics, purpose and functions along with necessary ROW. With the formulation of road hierarchy, road bylaws will be enforced. It should be followed by formulation of proper implementation strategies for/and use of various tools for land acquisition and compensation, method and stages of construction of roads and road side infrastructures and enforcement of road discipline and right of users. Development of such policies will support continuous development of the roads. The next stage is to clear the total right of way so that other infrastructures integrated with road can be developed. Until the end of clearing of proper right of way, the policies should be strong and well-informed. This will mark the entry to the next stage which is construction of full phase of all hierarchy roads.

Construction of higher hierarchy roads should be done in stages according to the necessity as guided by the developed lower hierarchy roads and corresponding demand of higher hierarchy roads they generate. The first stage should connect the pedestrian path and tracks along with double lane carriageway for all higher hierarchy roads. The development of Class "A" roads should follow construction of road space to the standard of Class "C" then gradually expanding to Class "B" and finally to Class "A". Class "B" roads should also follow the same development stages. Construction of well-connected pedestrian way and green belt along the edges of the ROW restricts any possible encroachment of the road space.

The staging implementation of the Municipal Transportation Master Plan for Sunilsmriti Rural Municipality integrates mid-period reviews, yearly maintenance plans, and stages of development for roads to ensure the efficient and effective execution of transportation projects. By following this phased approach, municipal authorities can adapt to changing conditions, allocate resources strategically, and deliver tangible benefits to residents, businesses, and visitors within the municipality. Through ongoing monitoring, evaluation, and stakeholder engagement, Sunilsmriti Rural Municipality can achieve its transportation goals and create a more sustainable, accessible, and resilient transportation system for the community.

CHAPTER 7: CONCLUSION AND RECOMMENDATION

Municipality Transport Master Plan has been prepared for Sunilsmriti Rural Municipality. A series surveys for data collection, series of different level interaction with the locals and various authorities was conducted. The study has identified all the roads of the municipality, their status and interventions required. The map of IDPM, MIM, MTPP and other maps has been prepared. Detail implementation strategy and budged expenditure plans have been prepared. The inventory shows that majority of roads are narrow and needs maintenance and upgrading. This is in line with the demand by the wards. The accessibility of roads has addressed most of the settlements but their mobility is very low. Access to facilities is hindered due to lack of reliable and safe public transport services within the rural municipality. Introduction of proper municipal buses and public transport is pertinent to fuel the development process at earliest.

The study has formulated hierarchy of roads which is necessary for long term rapid development of the municipal area. The report presents the necessary functions of the roads and their characteristics. Possible cross sections are also recommended. The study has shown high proportion of active road users which have been addressed thorough provision of pedestrian facilities in all roads except access roads. This is necessary to be implemented as the developed regions are having trouble to address the demand of active mode user friendly road infrastructures, Sunilsmriti Rural Municipality has the opportunity to sustain the road users and create a sustainable and well-planned urban road network and infrastructure. As the implementation strategy suggests, the rural municipality needs to develop proper framework and policies for the implementation of the perspective plans, built the capacity of the rural municipality and the local organizations and committees and proper stages of development of the roads.

This study should be revised and integrated with other plans that will be developed in coming years. Periodic review and update of the plans is necessary according to the change in land use and traffic that occurs in the future. A mid period review in the third year and five yearly MTMP should be prepared every five years.

The Municipal Transport Master Plan report for Sunilsmriti Rural Municipality represents a comprehensive and strategic roadmap for the development of transportation infrastructure and services within the rural municipality. Through a systematic analysis of current conditions, future trends, and stakeholder input, the Master Plan provides valuable insights into the transportation needs, challenges, and opportunities facing Sunilsmriti Rural Municipality. By outlining a vision,

goals, and actionable strategies for improving mobility, enhancing connectivity, and promoting sustainability, the Master Plan serves as a guiding framework for shaping the future of transportation in the municipality.

Importance:

The importance of the Municipal Transport Master Plan cannot be overstated. It serves as a vital tool for planning, policy-making, and decision-making processes, providing a holistic understanding of the transportation system and its interactions with land use, economic development, and environmental sustainability. The Master Plan helps prioritize investments, allocate resources, and coordinate actions across various stakeholders to achieve common objectives and address pressing transportation challenges. Furthermore, the Master Plan promotes transparency, accountability, and public engagement by involving stakeholders in the planning process and ensuring that their voices are heard and considered.

Use:

The Municipal Transport Master Plan serves as a practical guide for municipal authorities, transportation agencies, developers, businesses, and community organizations involved in transportation planning and development activities. It informs land use decisions, infrastructure investments, regulatory policies, and service provision strategies to create a more efficient, equitable, and resilient transportation system. The Master Plan also facilitates coordination and collaboration among different sectors and levels of government, fostering synergy and alignment in achieving shared transportation goals. Moreover, the Master Plan provides a basis for monitoring and evaluation efforts to assess the effectiveness of transportation interventions, track progress towards established targets, and adapt strategies in response to changing conditions and emerging needs.

Implementation:

To ensure the successful implementation of the Municipal Transport Master Plan, concerted efforts are needed from all stakeholders involved. Municipal authorities must demonstrate leadership and commitment to prioritize transportation initiatives, allocate sufficient resources, and provide institutional support for plan implementation. Collaboration with external partners, including government agencies, financial institutions, development organizations, and private sector entities, is essential to mobilize funding, expertise, and technical assistance for implementing transportation projects. Public engagement and participation should be encouraged throughout the implementation process to build support, gather feedback, and address concerns

from affected communities. Additionally, effective communication, monitoring, and evaluation mechanisms should be established to track progress, measure performance, and make necessary adjustments to ensure the continued relevance and effectiveness of the Master Plan.

Recommendations:

Based on the findings and recommendations of the Municipal Transport Master Plan, several key recommendations can be made to guide future actions and initiatives in Sunilsmriti Rural Municipality:

Prioritize investments in public transit infrastructure and services to improve accessibility, reduce congestion, and promote sustainable mobility options.

Enhance pedestrians to create safe, walkable streets that encourage active transportation modes and enhance quality of life.

Integrate land use planning with transportation planning to promote compact, mixed-use development patterns that minimize travel demand and support transit-oriented development.

Implement traffic management measures, including intelligent transportation systems, traffic calming techniques, and parking management strategies, to improve traffic flow and enhance road safety.

Strengthen governance and institutional capacity for transportation planning, implementation, and management through training, capacity-building initiatives, and institutional reforms.

Foster partnerships and collaboration with relevant stakeholders, including neighboring municipalities, regional authorities, and community groups, to address shared transportation challenges and leverage resources for mutual benefit.

Regularly review and update the Municipal Transport Master Plan to reflect changing circumstances, emerging trends, and evolving priorities, ensuring its continued relevance and effectiveness in guiding transportation development in Sunilsmriti Rural Municipality.

In conclusion, the Municipal Transport Master Plan represents a valuable tool for shaping the future of transportation in Sunilsmriti Rural Municipality. By implementing the recommendations outlined in the Master Plan and fostering collaboration among stakeholders, the rural municipality can create a more efficient, accessible, and sustainable transportation system that meets the needs of residents, supports economic growth, and enhances the overall quality of life in the community.

GLOSSARY

Active transport user	Active transport (also called non-motorized transport, NMT and human powered transport) refers to walking, cycling, and variants such as wheelchair, scooter and handcart use. It includes both utilitarian and recreational travel activity, plus stationary uses of pedestrian environments such as standing on sidewalks and sitting at bus stops
Capacity	The maximum number of vehicles that can pass over a given section of a lane or roadway in one direction (or in both directions for a two-lane or three-lane highway) during conditions.
Collector road	Collector roads provide both access and movement within residential, commercial and industrial areas. They are typically discontinuous between residential areas, so as to avoid traffic infiltration through neighborhoods. Lower density developments and community land uses such as schools and convenience retail are often located on collector streets.
Emergency maintenance	Maintenance works that are to be carried out due to unexpected and sudden blockage of roads that stop vehicular movement due to natural disaster
Forecasting	The process of determining the future values of land use, socioeconomic, and trip making variables within the study area.
Local road	Local roads provide direct property access in residential, industrial, commercial and downtown areas. With local streets connecting primarily to collector roads, travel distances are short, speeds are relatively low and volumes are modest, as their primary function of accommodating traffic from adjacent lands.
Maintenance	The process of preserving the original condition or function of an asset
MTMP	The MTMP is a strategic planning document designed to identify and address the municipality's needs to the year 2025 and beyond. The MTMP is the documents that identify, classify and prioritize the municipal roads; identify possible sources of funds and materials for the construction of the prioritized roads according to their respective standards and scientific mobilization of the available resource.
Network	Set of nodes and connecting links that represent transportation facilities in an area.

Origin	The location of the beginning of a trip or the zone in which a trip begins.
Periodic maintenance	Maintenance works to be carried out in intervals of years and of large-scale
Recurrent maintenance	Small maintenance works not falling under routine maintenance that are carried out a few times a year in all roads to repair minor damage resulting from traffic and rainfall
Routine maintenance	Small maintenance works that are to be carried out in all the seasons on all roads on a regular basis
Specific maintenance	Spot treatments and repairs that do not occur every year or in every road, and which are very specific in nature and location.
Trip	A one-direction movement which begins at the origin at the start time, ends at the destination at the arrival time, and is conducted for a specific purpose.
Upgrading	The process of addition or change that makes something better than it was before

REFERENCES

American Planning Association. (2017). Transportation Planning Handbook. American Planning Association.

Australia, M. R. (2011). Road Hierarchy Criteria.

Cervero, R., & Kockelman, K. (1997). Travel Demand and the 3Ds: Density, Diversity, and Design. Transportation Research Part D: Transport and Environment, 2(3), 199-219.

Central Bureau of Statistics. (2021). National Census 2021. Kathmandu: Government of Nepal, National Planning Commission Secretariat.

Cole, S. (2005). Applied Transport Economics Policy, Management and Decision Making. London: Kogan Page Limited.

Department of Roads, Nepal Road Standard 2070.

Elgar, E. (2002). Transport Economics. Cheltenham: Edward ELgar Publishing Limited.

Eppell, V. A., Bunker, J., & McClurg, B. (2001). A four level road hierarchy for network planning and management. Proceedings 20th ARRB Conference. Melbourne: Jaeger, Vicki, Eds.

Federal Highway Administration. (2017). Transportation Planning Handbook. Washington, DC: U.S. Department of Transportation.

Gurung, M., & Shrestha, S. (2018). Urban Transportation Planning: A Case Study of Kathmandu Valley. Kathmandu, Nepal: Nepal Engineering College.

kadiyali, D. L. (2011). Traffic Engineering and Transport planning.

Litman, T. (2015). Evaluating Active Transport Benefits and Costs (Guide to valuing walking and cycling improvements and encouragement programs). Victooria Transport Policy Institute.

Litman, T. (2020). Transportation Demand Management: A Sustainable Approach to Reducing Greenhouse Gas Emissions. Victoria, Canada: Victoria Transport Policy Institute.

McClurg, B., Bunker , J., & Eppell, V. (2001). A four level road hierarchy for network planning and management. ARRB. Melbourne.

Meyer M.D & Miller E.J. Urban Transportation Planning.

Ministry of Transport and Highways, India. (2019). National Urban Transport Policy. New Delhi, India: Government of India

National Planning Commission. (2021). National population and housing census (A national report). Kathmandu: Central Bureau of Statistics.

Government of Nepal, (2068). Nepal Urban Road Standard 2068 (Draft).

TRB. (2013). Transit capacity and quality of service manual. Washington D.C.: Transit cooperative research program.

The World Bank. (2016). Urban Transport Strategy Review: A Strategic Approach to Sustainable Urban Transport. Washington, DC: The World Bank Group.

Gautam, S., & Khanal, S. (2017). Sustainable Transportation Planning: Lessons from Developing Countries. Kathmandu, Nepal: Environment and Public Health Organization.

Central Bureau of Statistics, Nepal. (2020). Nepal Living Standards Survey. Kathmandu, Nepal: Government of Nepal.

Ministry of Urban Development, Nepal. (2015). National Urban Transport Policy. Kathmandu, Nepal: Government of Nepal.

Indian Roads Congress. (2018). Guidelines for Urban Road Development. New Delhi, India: Indian Roads Congress.

Ministry of Road Transport and Highways, India. (2017). The Motor Vehicles Act, 1988. New Delhi, India: Government of India.

Bhattarai, P., & Shrestha, R. (2019). Transport Infrastructure Development: Challenges and Opportunities in Nepal. Kathmandu, Nepal: Nepal Infrastructure Development Association.

Central Pollution Control Board, India. (2020). Comprehensive Environmental Pollution Index Report. New Delhi, India: Government of India.

Ministry of Housing and Urban Affairs, India. (2015). Model Building Bye-Laws. New Delhi, India: Government of India.

International Institute for Environment and Development. (2017). Urban Transport Planning and Management: Best Practices and Innovations. London, UK: IIED.

Nepal Engineering Council. (2018). Code of Practice for Road Construction. Kathmandu, Nepal: Nepal Engineering Council.

Newman, P., & Kenworthy, J. (2015). The End of Automobile Dependence: How Cities are Moving Beyond Car-Based Planning. Island Press.

Ortúzar, J. D., & Willumsen, L. G. (2011). Modeling Transport. John Wiley & Sons.

Rodriguez, D. A., & Targa, F. (2018). Transport and Land Use: Interaction: An Overview. In Land Use and Transportation (pp. 3-16). Elsevier.

Transportation Research Board. (2010). Transportation Planning Handbook. National Academies Press.

Vickerman, R. (2014). Infrastructure and Regional Development. In Handbook of Regional and Urban Economics (Vol. 4, pp. 975-1010). Elsevier.

Wachs, M. (2001). Ethics and Equity in Transportation Planning. Journal of the American Planning Association, 67(4), 393-408.

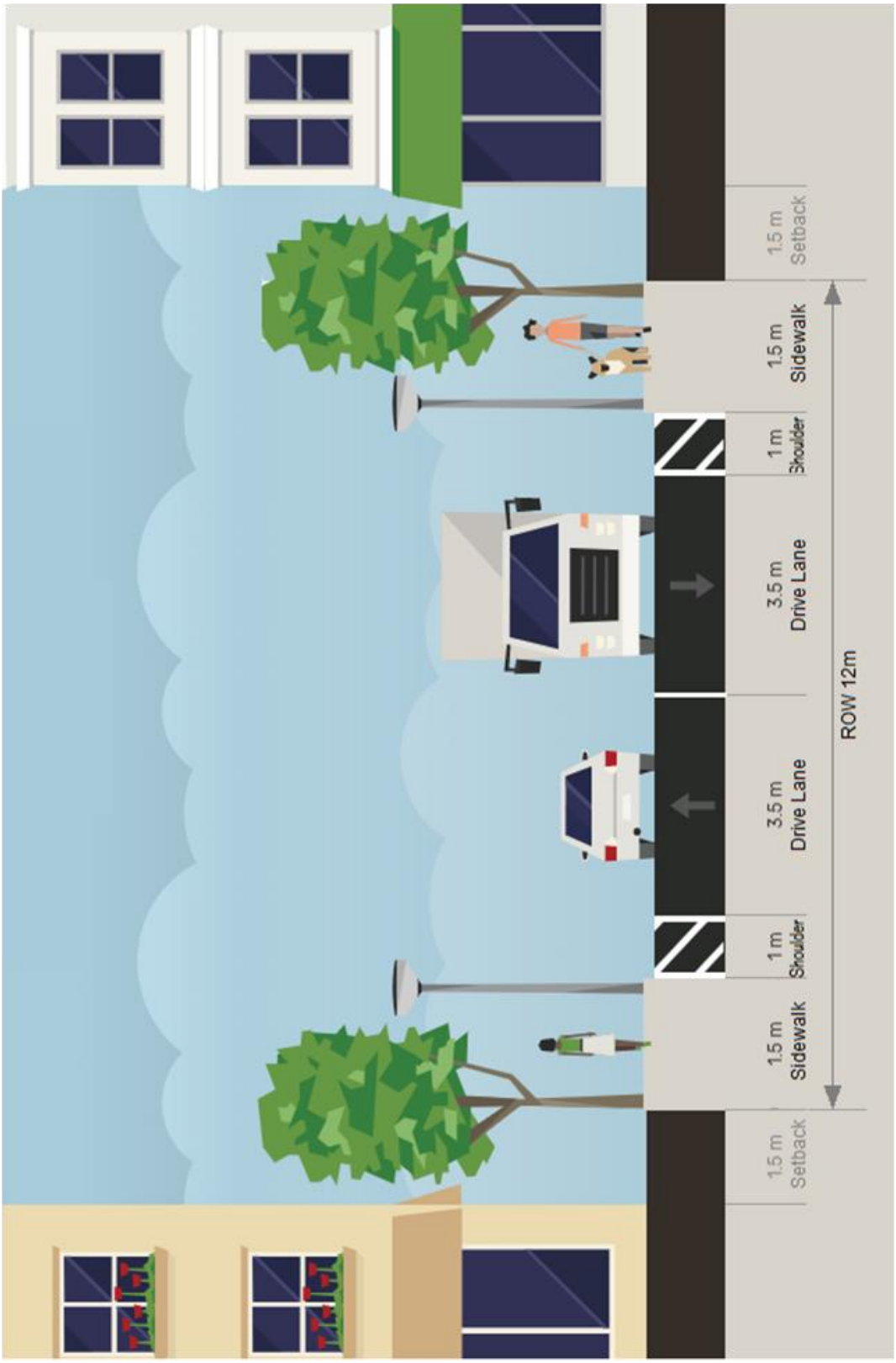
World Bank. (2002). Sustainable Transport: Priorities for Policy Reform. World Bank Publications.

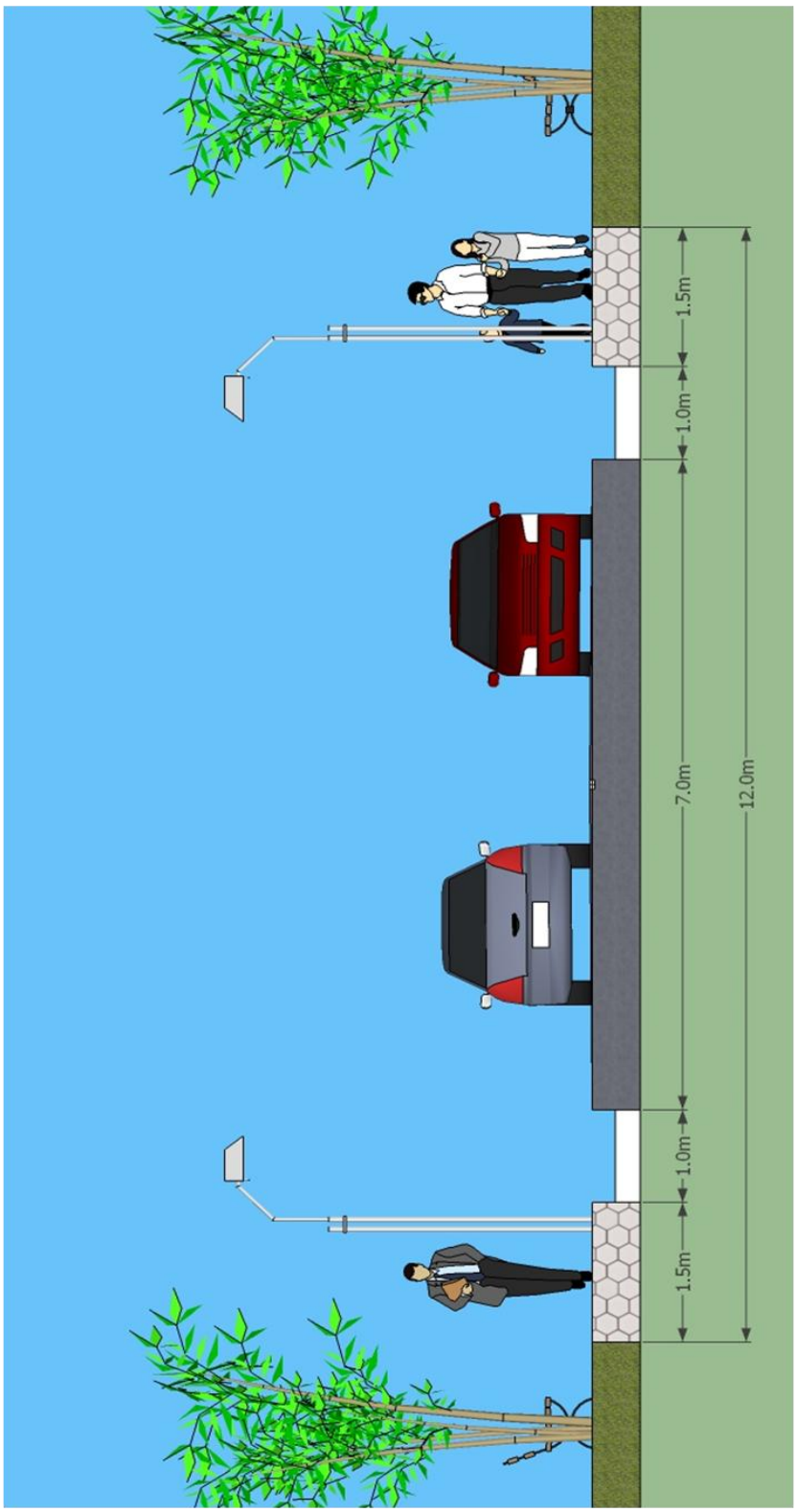
Zhang, L., & Levinson, D. (2004). The Economics of Transportation Network Growth. In Empirical Studies of Environmental Policies in Europe (pp. 49-76). Springer.

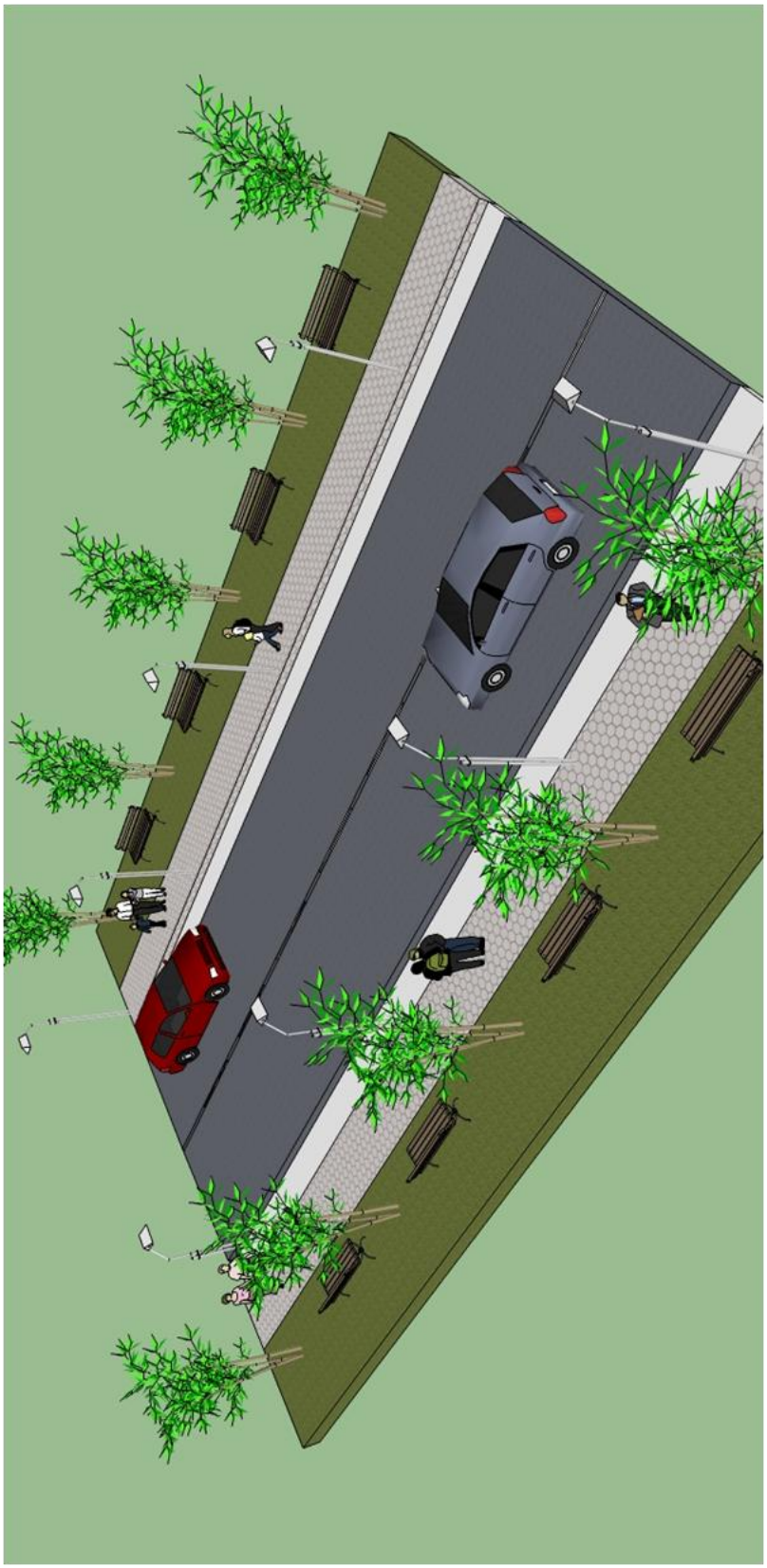
ANNEX

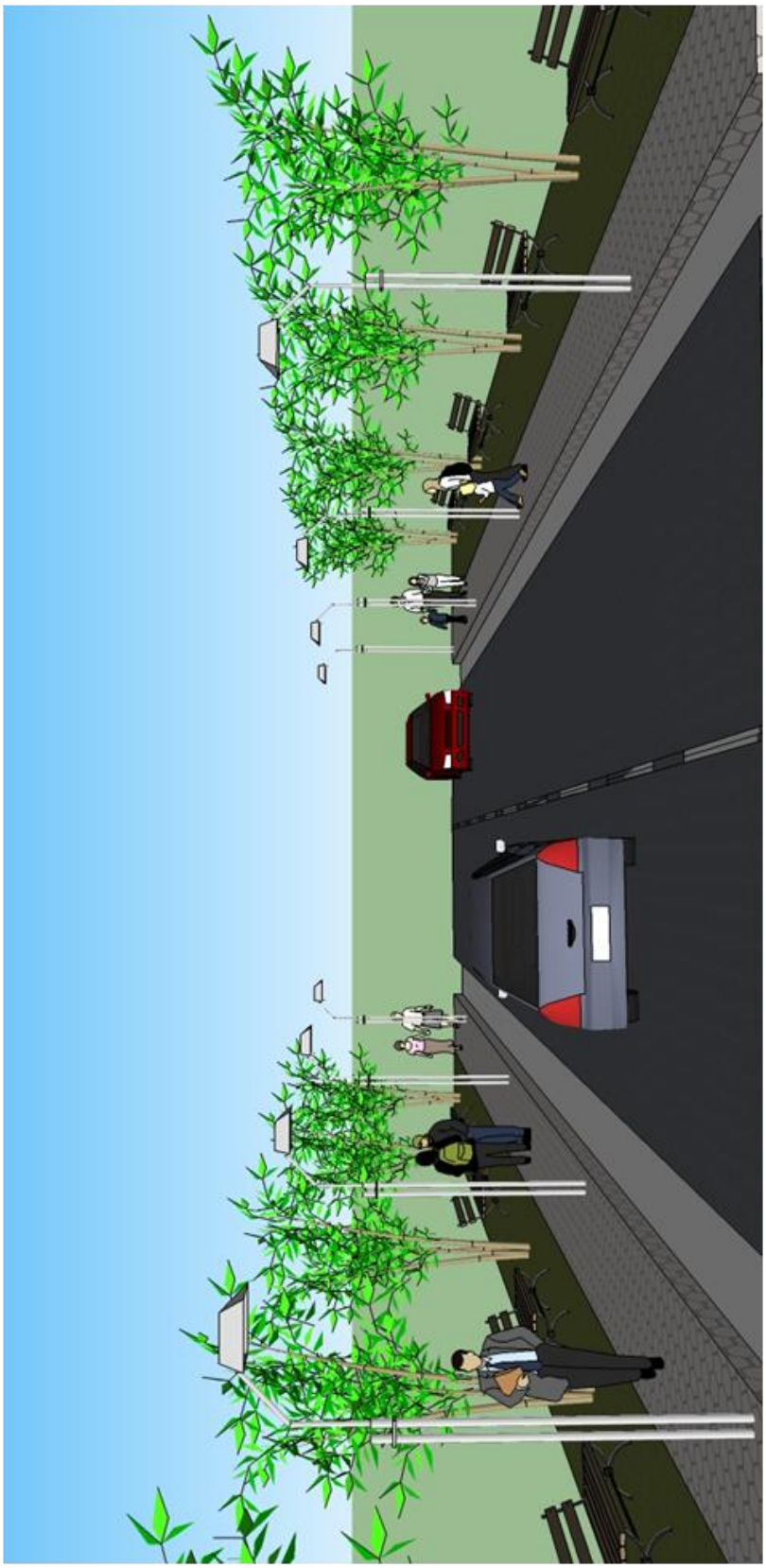
ANNEX I: ROAD CLASSIFICATION DIAGRAMS

CLASS A ROAD

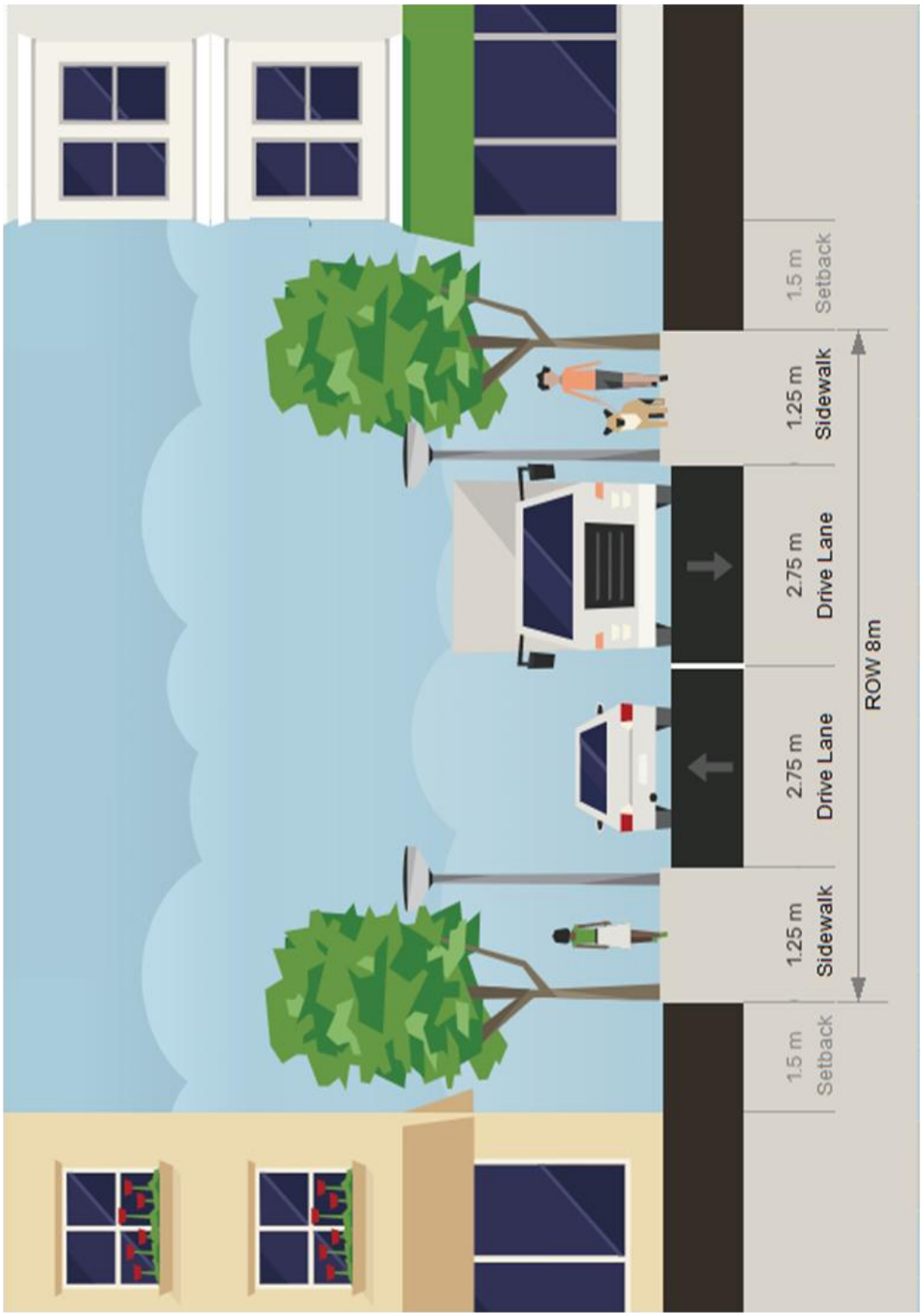

1.5 m Setback
1.5 m Sidewalk
1 m Shoulder
3.5 m Drive Lane
3.5 m Drive Lane
1 m Shoulder
1.5 m Sidewalk
1.5 m Setback
ROW 12m

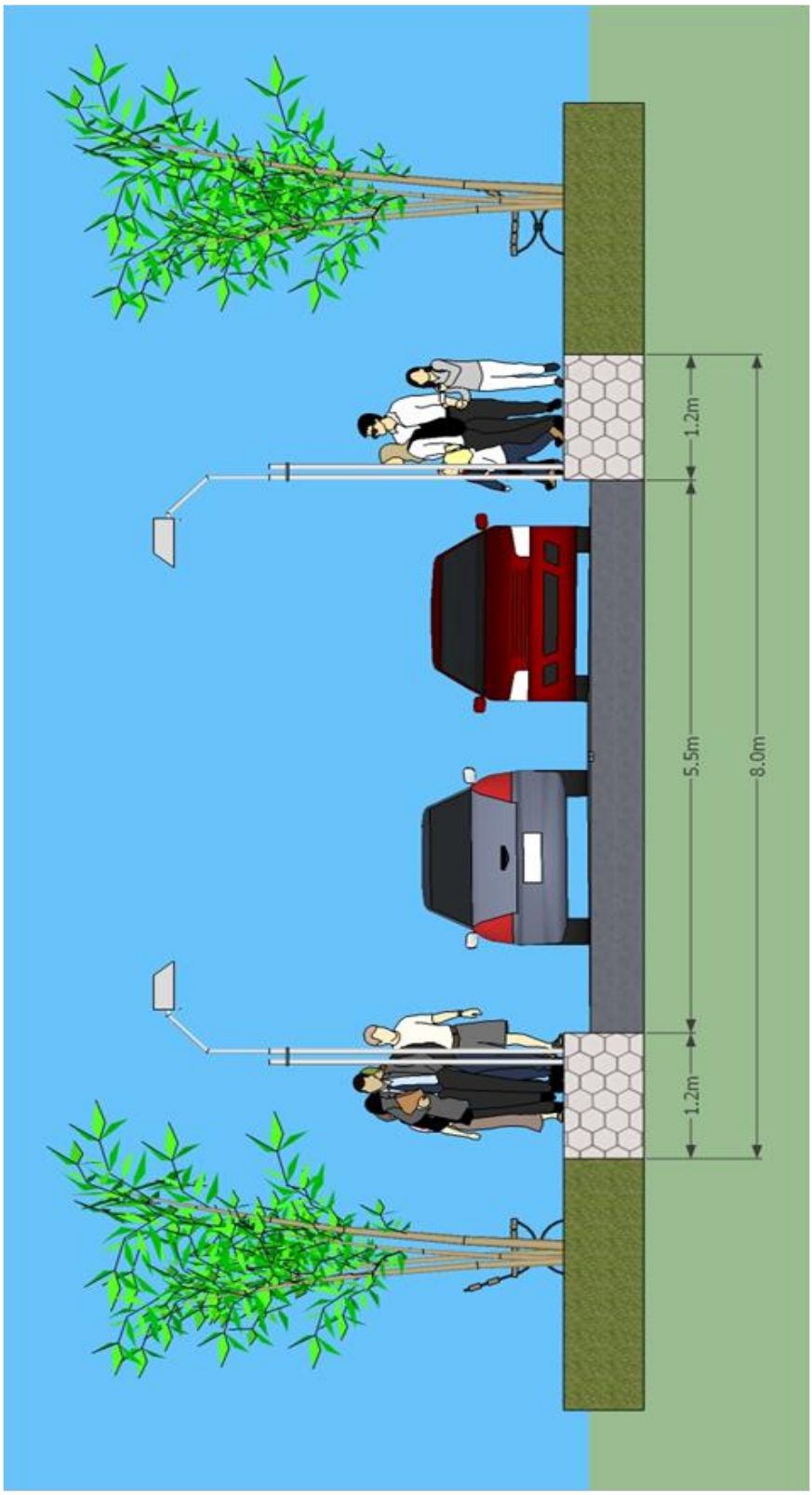

1.5m
1.0m
7.0m
12.0m
1.0m
1.5m

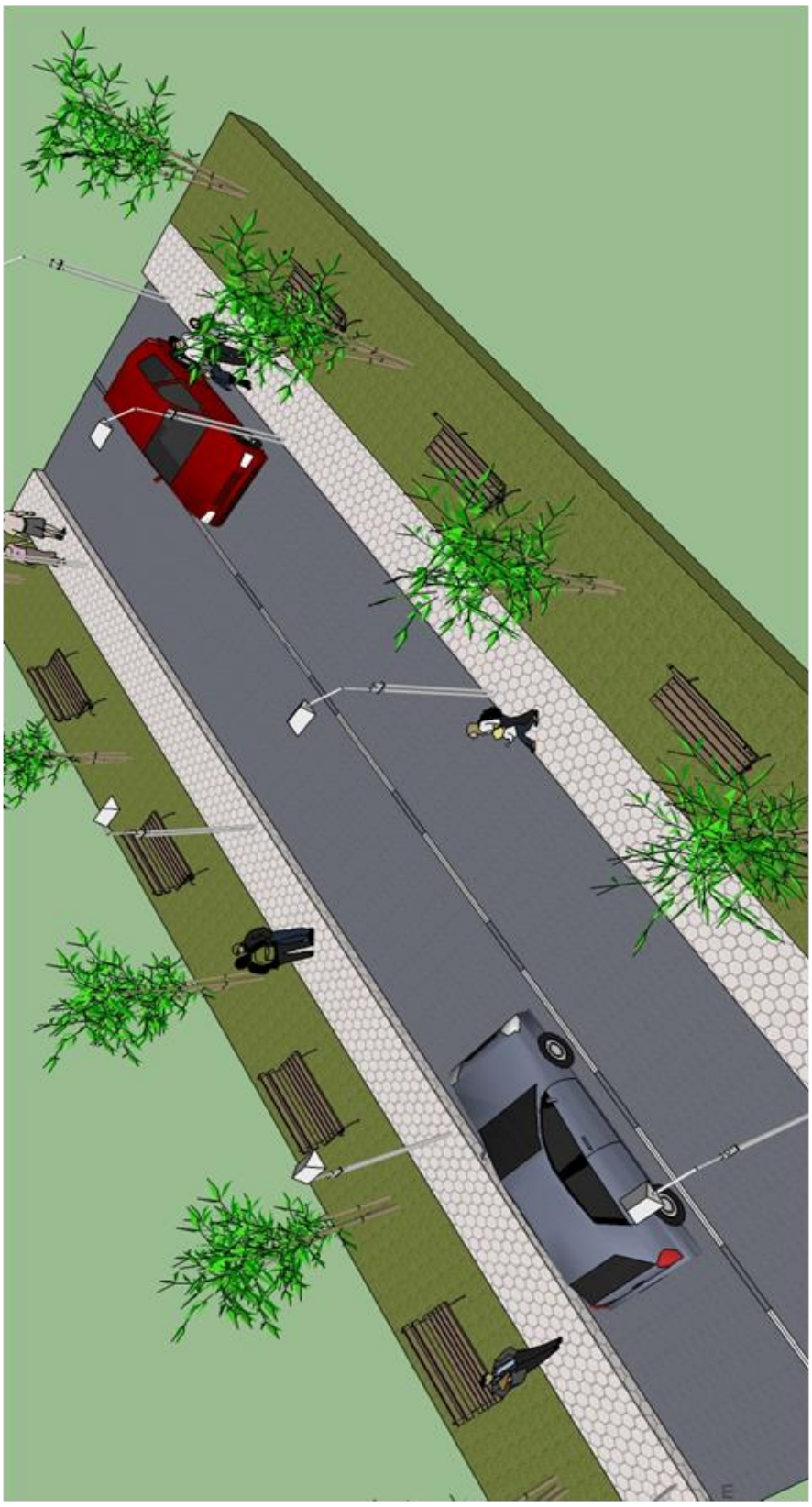




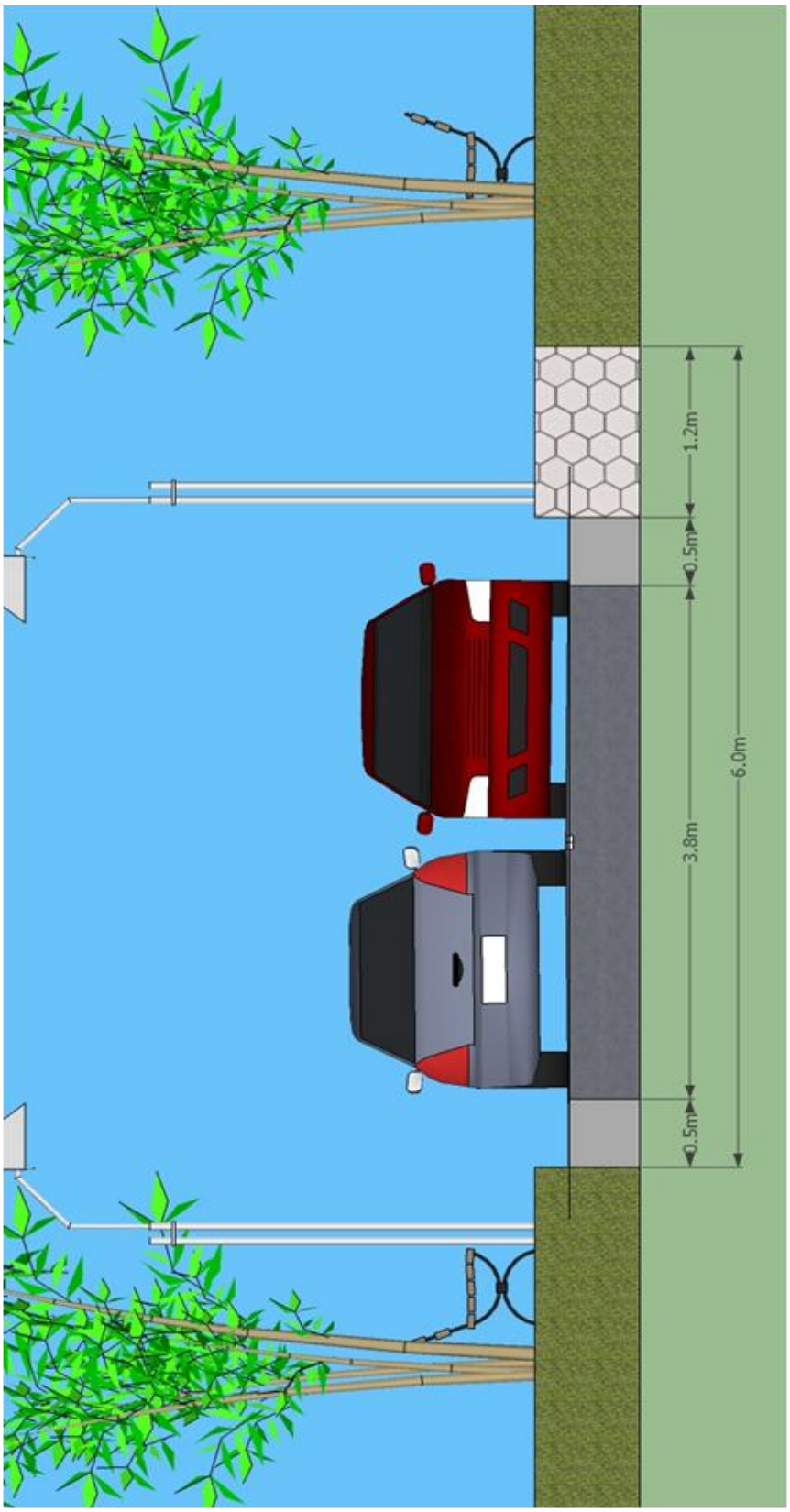
CLASS B ROAD

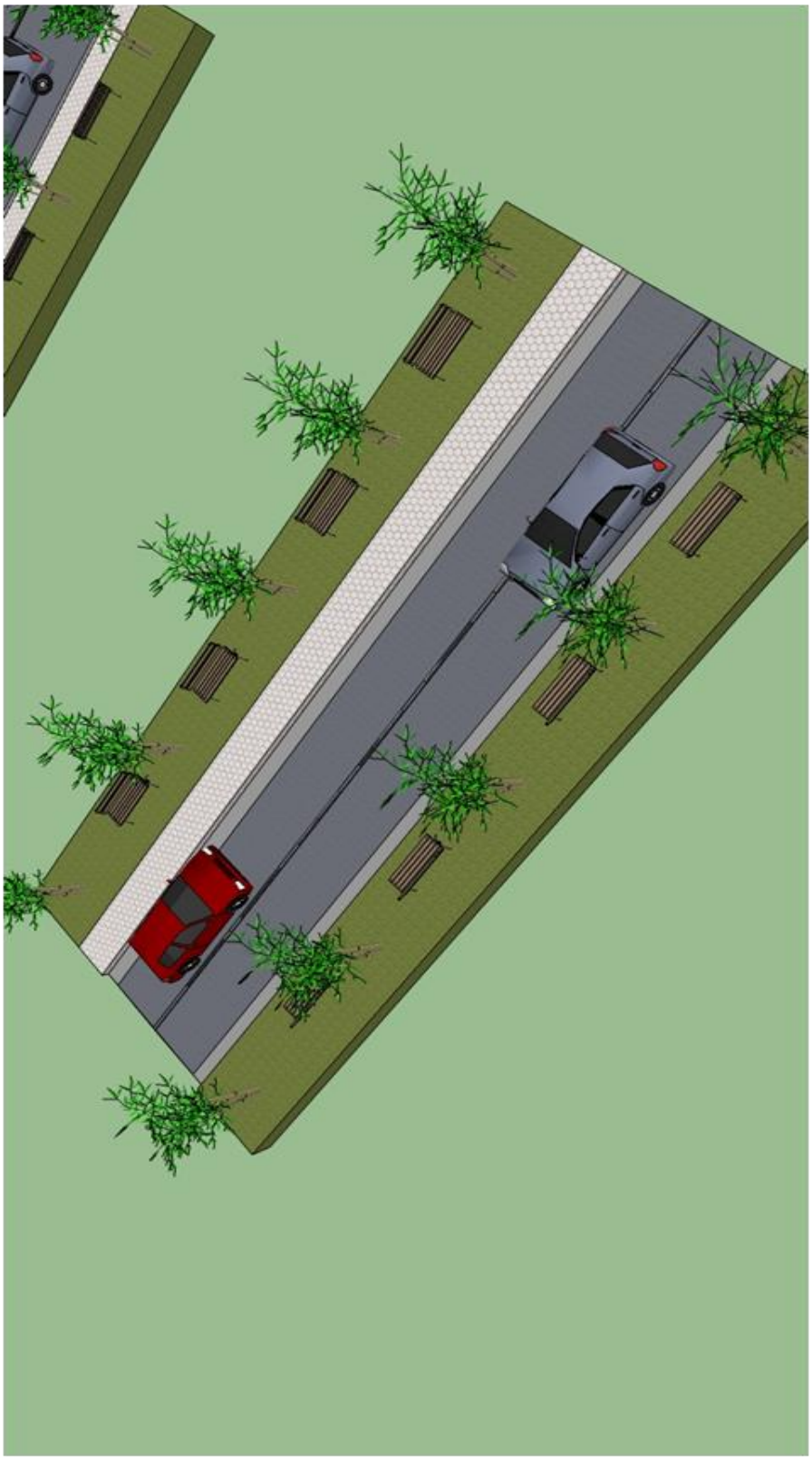

1.5 m
Setback
1.25 m
Sidewalk
2.75 m
Drive Lane
2.75 m
Drive Lane
ROW 8m
1.25 m
Sidewalk
1.5 m
Setback

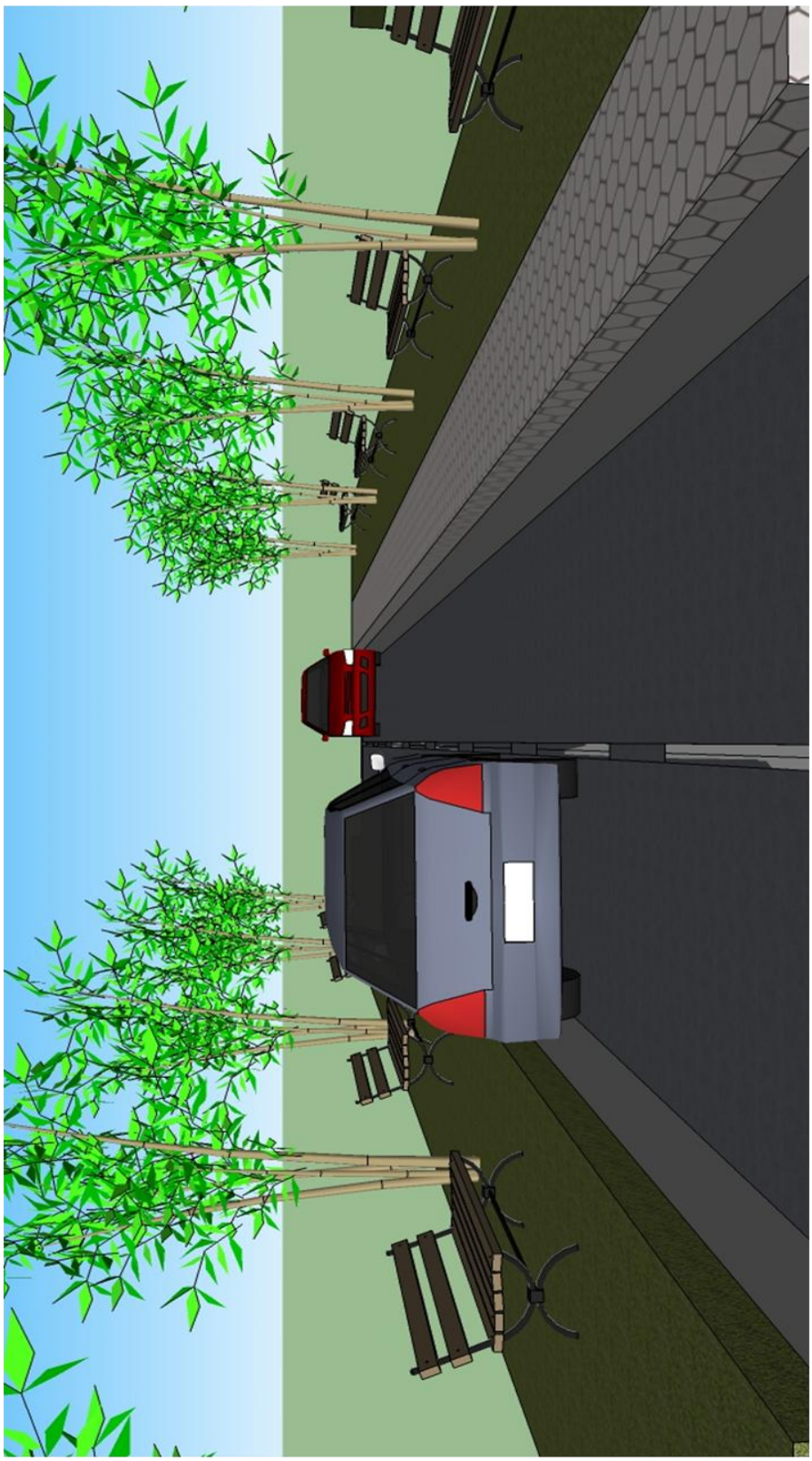

1.2m
5.5m
8.0m
1.2m



CLASS C ROAD


1.2m
0.5m
3.8m
6.0m
0.5m





ANNEX II: MAPS

ANNEX III: PHOTOGRAPHS







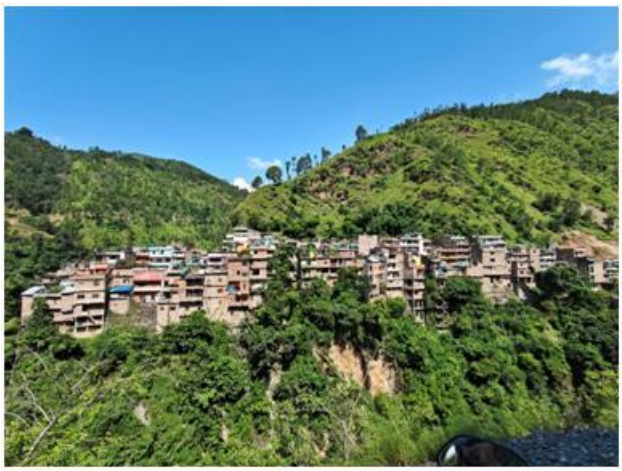





श्री सूर्योदय माध्यमिक विद्यालय तथा शप प्राविधिक विद्यालय


WELCOME


घोडा खोला पुल
GHODA KHOLA BRIDGE




सडक पर्वाधार विकास कार्यालय