MUNICIPAL TRANSPORT MASTER PLAN

Suryabinayak Municipaliy,

Katunje, Bhaktapur

Global Information Survey and Mapping Concern Pvt.Ltd

Volume I: Main Report

FINAL REPORT

Project Information Sheet

Project Information

Name of the Project	Municipal Transport Master Plan of Suryabinayak municipality
Name of the Client	Government of Nepal Ministry of Federal Affairs and Local Development Suryabinayak Municipality, Katunje, Bhaktapur
Name of theConsultant	Global Information Survey and Mapping Concern Pvt.Ltd. Itahari, Sunsari

Submission Information

Name of the Report	Municipal Transport Master Plan of Dharmadevi municipality
Number of Volumes	2
Date of Submission	2079
Submission Type	Hard Copy
Hard Copies Produced	2
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Acknowledgment

The Consultant team would like to express our deep sense of gratitude to the Suryabinayak Municipality Office for providing us the opportunity for the “Preparation of “Municipality Transport Master Plan for Suryabinayak Municipality”. The team extends its sincere gratitude to Mayor Mr. Basudev Thapa, Deputy Mayor Ms. Sarita Timsina, Chief Administrative Officer Mr. Rajendra Prasad Kandel and all staffs from the municipality for facilitating and supporting during the study.

The team is even obliged to all the locals from the study area for their interest as well as support during the ward meetings and field visit. We would like to thank the entire municipal office team for their support, cooperation and coordination during the entire field work. We would like to express our special thanks to the ward representatives and different political parties representatives from different line agencies and other representatives for their support and involvement in the data collection process. We are grateful for the support and patience of the local citizens of Suryabinayak Municipality for their participation and contribution in different surveys conducted by the team.

The study team

Acronyms and Abbreviations

CBS	Central Bureau of Statistics
DTMP	District Transport Master Plan
DUDBC	Department of Urban Development and Building Construction
UDBO	Urban Development and Building Office
FGD	Focused Group Discussion
GIS	Geographic Information System
GPS	Global Positioning System
IDPM	Indicative Development Potential Map
Kmph	Kilometer per hour
MIM	Municipal Road Inventory Map
MoFALD	Ministry of Federal Affairs and Local Development
MRCC	Municipal Road Coordination Committee
MTMP	Municipal Transport Master Plan
MTPP	Municipal Transport Perspective Plan
MUTM	Modified Universal Transverse Mercator
OD	Origin and Destination
sq. km.	Square Kilometer
SRN	Strategic Road Network
VDC	Village Development Committee
KV	Kathmandu Valley

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Executive Summary

Suryabinayak Municipality situated in north-east part of Kathmandu valley in Province 3. Suryabinayak Municipality is one of the 4 newly declared municipalities in Bhaktapur district. It is located about 14 Km southeast of Kathmandu and lies between 85°29′38″ E and 85°21′36″ E longitude and 27°40′30″ N and 27°37′12″ N. latitude. Suryabinayak Municipality was declared on December 2014 merging four VDCs, Kautunje, Sipadol, Nankhel and Chitpol VDCs of Bhaktapur. And Anantalingeshwor Municipality was formed combining four VDCs Sirutar, Gundu, Dahikot and Balkot. Later in 2016 Suryabinayak Municipality was expaned including Anantalingeshwor Municipality. It is now divided into ten wards and the area covered by the municipality is 47.587 sq.km The highest altitude of the municipality is 2022 meters and lowest level is 1276 meters.

As per 2021 population census, out of total wards, ward number 8 had the largest population 22951, while ward number 9 had least number of population with 6709. The ward number 8 had most households with total 5813, while ward number 9 had least number of households with total 1623 number of households. The population to household ratio was 3.91, which means that in average 3.91 family members lived in each household.

Preparation of Municipal Transport Master Plan of Suryabinayak Municipality is a milestone step towards the planned development of the municipality. It mainly focuses to support the envisioned growth, a well-connected road network providing safe, efficient and comfortable movement of goods and people is vital. A road network supporting the desired movement is basic infrastructure for the development of other infrastructures and services in the municipality. As such, the preparation of MTMP presents a huge opportunity to grasp the potential growth by developing the necessary road network of the different hierarchy of roads in its early phase. At the same time, its implementation will present various challenges.

A participatory bottom-up approach has been used to prepare the MTMP. The approach was adopted through the formation of a member committee (municipal road coordination committee (MRCC)) of the techno-political interface that included representatives and technicians from the municipality, other stakeholders and active political parties in the municipality. To increase the participation of the local people, ward level discussion program was facilitated by the study team and the suggestions were collected. The team has also tried to adopt data-driven decision making by collecting necessary secondary and primary data. The preliminary study identified collection of socio-economic data, origin and destination, and characteristics of daily trips, the status of the existing road and transport infrastructure, demand/vision of the locals, status of existing services, road safety risks and use of the roads by traffic as the required primary data. The collected data provides a strong base for planning the development at present and in the future as well.

Suryabinayak Municipality is one of such municipal area which is rapidly facing the increased migrants from nearby surrounding and rapid urbanization. Due to the current trend of population and housing growth the municipality is feeling the rapid increase in housing,

infrastructures and urban service demand. This newly formed Municipality needs yet to define and implement the basic parameter of urban management such as municipal manage plan, enactment and compulsory enforcement of building and planning bylaws etc. Hence serious urban environmental issues have emerged including insufficiency of transportation, inadequate drinking water supply, uncontrolled and unmanageable urban development resulting in urban sprawl within the municipality and surrounding municipalities.

The inventory survey of all the roads in the municipality shows that among class A, B, C and D in Suryabinayak Municipality are gravelled (35.52%), blacktopped (48.79%), stone soling(0.71%), brick soling(0.25%) and block soling(0.66%). The wardwise Surface type distribution shows that the the presence of blacktopped roads at ward 8 is high due to the presence of various infrastructures. Almost every ward have large proportion of gravelled roads. The presence of earthen roads at ward 4, 8 and 10 is comparatively high than other wards.

The road network in Suryabinayak Municipality is composed of two national highways, three feeder roads, strategic urban roads, district roads, and local/municipal roads. The roads are categorised as strategic road network consisting of the highway and feeder roads. The Strategic Roads Network (SRN) are constructed and maintained centrally by the department of roads (DoR). Suryabinayak municipality consists of a total of about 15 km of National Highways, in which Arniko Highway consist of 9.528 km of Blacktopped roads and the NH38, Kathmandu Outer Ringroad which is proposed of 5.106 km, and 12 km of Feeder Roads and Strategic Urban Road of 0.476 km

The road density per total area is lowest for Ward 7 with a value of about 12.214 km per sq. km while it is highest for Ward 3 with a value of 39.73 km per sq.km. This means that while the total length of road per total area is very low for this ward, the large amount of unusable land means that the length per usable land is very high. Similarly, the road density per 1000 population is highest for ward 9 with a value of 16.543 km/1000 population, while it is lowest for ward 2 with a value of 2.284 km/1000 population.

The presence of Strategic Road Network in large amounts , however the connectivity of these roads is not conveniently accessible to every wards within the municipality due to developed infrastructure and population denseness. The road hierarchy and its network developed supports such destinations, existing settlement, other infrastructures and potential development dictated by the envisioned land-use zoning. The planned network of the road of Class A, B and C along with the SRN provides access to public transport for all the people. The output of the analysis shows that all of the settlements will have access to the roads of at least Class C that will enable easily accessibility from the households to the road network. As shown in thetable below, about 92.53% of the total households will have access to the road within a walking distanceof 5 minutes. The remaining households will be able to utilize the roads within a walking time of less than 20 minutes. The municipality is further facilitated by the presence of about 27 km of Strategic Road Network (SRN) providing linkage to different locations within the municipality.

SECTION 1 INTRODUCTION

Municipal Transport Master Plan (MTMP) shall be defined as the process of Identification, classification and prioritization of roads within municipality; construction, upgrading, maintenance and rehabilitation of prioritized roads on the basis of approved criteria with calculation of financial budget. The background for preparation of transport master plan along with the objectives and the scope of planning has stated in this chapter. The basic approach for the preparation of MTMP is the bottom up and participatory approach.

1.1 Background

Development of transportation infrastructure is one of the most essential groundwork for opening other avenues of development. Proper development of transportation system opens accessibility of the people to larger markets, service centers and overall economic sectors. Development of roads also leads to the development of urban centers with amenities like hospitals, schools, markets, services etc. Roads establish significant linkages with the large neighboring cities with vibrancy of economy, human activities and transactions. It has prioritized the development of sustainable Municipal Transport Master Plan (MTMP) which is expected to address the need of opening an easy access to people's mobility in particular and inception of avenues of all kinds of development in general.

As seen in many municipalities of Nepal, haphazard population growth is visible paving a way for unplanned and unmanaged development of urban infrastructures and facilities; resulting in the inadequacy of the provided service and infrastructure. Such an increase in population and the consequent increase in demand for different services and infrastructures affects the road and transport sector most extensively. This is because of the fact that transport is the backbone for the development of all otherinfrastructures. Safe, efficient and comfortable use of existing transport services and infrastructure supporting the surrounding environment and all the users is necessary for a healthy and liveable city. A high economic value/trip demands higher mobility and better transport service. Land transport is the backbone of transportation and other facilities in Surybinayak municipality. Movement on land is done through a network of interconnected roads.

The transport network is complex and large scale system in different hierarchies according to the demand of hierarchy of settlement development and geographical alternation. The increase in the number of vehicles demands wider roads which are restricted by the developed built-up area along the roads. Therefore, it is necessary to plan and maintain a road hierarchy for long term sustainability and serviceability. Although the exact nomenclature of the roads of different hierarchy varies, they basically comprise offreeways, arterials, collectors and local roads. The strategic transport network is the top hierarchy and the local transport network is the bottom hierarchy transport network. It is necessary to plan a properhierarchy of roads to maintain smooth operation and avoid bottlenecks.

The transport sector is also known for its high energy use and greenhouse emission. A large number of premature deaths due to respiratory disease are attributed to vehicular emissions.

Rapid urbanization and motorization with diminishing urban greenery add to the misery of the people residing in the urban area. The reduction in the level of service and rapid motorization is a sign of a vicious cycle where the quality of road infrastructure and public transport service is reduced resulting in reliance of people in private mode which further degrades the road performance through increased congestion. Congestion further reduces the reliability of the public transport service and undermines the supplied capacity of the infrastructure. It is thus necessary to break the vicious cycle to turn it into a virtuous cycle.

The main purpose of MTMP is to prepare the inventory of existing infrastructures and prepare plans of management tools and investments in the transport sector for the overall sustainable development of the urban economy and environment. Based on other plans already prepared, existing and potential development areas – the road network will be planned and prioritized for investment. After a comprehensive study of the study area both in settlement level, municipal level and regional context, necessary interventions from the construction of new road linkages to upgrading and maintenance of the existing road linkages will be planned. Therefore, municipal transport master plan (MTMP) incorporates identification, mapping and classification of existing road network in the municipality along with formulation of vision for the development of the transport sector; followed by identification of required intervention (new construction/ upgrading/ rehabilitation/ maintenance), prioritization and, preparation of physical and financial implementation plan.

1.2 Objectives

The overall objective of the consulting service is to prepare the Transport Master Plan of Suryabinayak Municipality. As a part of the TMP preparation, accessibility planning could be an effective tool to assess the existing situation of the services and facilities. The interventions derived from the accessibility and mobility planning will represent the real needs and priorities of the local people. The planning approach is participatory and bottom-up from the settlement level. The implementations of such projects will certainly be more participatory and owned by the local communities.

The MTMP is designed to take account of the real needs of the people for infrastructure as per the comprehensive town development plan. The specific objectives of the assignment, but not necessarily limited to the following are:

- Prepare inventory of the municipal road network and its map (MIIM).
- Identify the major road linkages within the municipality and with the surrounding areas.
- Prepare indicative development potential map (IDPM) of Suryabinayak Municipality.
- Finalize the visionary city development plan if comprehensive town development plan is not prepared.
- Collect demands for new construction/rehabilitation of transport linkages from

municipalities/settlements based on the city development plan.

- Analyse present mobility and accessibility situation.
- Identify and prioritize the interventions based on mobility and accessibility situation.
- Develop scoring criteria and approve it from the municipality.
- Prepare the perspective plan of transport services and facilities (municipal transport perspective plan)
- Prepare physical and financial implementation plan of prioritized roads for the MTMP period.
- Prepare a five years Municipal Transport Master Plan (MTMP).

1.3 Scope of Work

The consultant shall provide high-quality professional services for the preparation of TMP/MTPP, with the reference to the attached annexes and integrated urban development plan (IUDP). The scope of services to be carried out by the consultant shall broadly include, but not be limited to the following:

a. Assist in the formulation of municipal road coordination committee (MRCC)

The main task of MRCC is to provide support to the municipality in formulating, managing and monitoring municipal road transport infrastructure policies, rules, and regulations.

b. Review of existing plans and secondary data

The consultant shall study the existing and past plan and programmes prepared for the municipality. It should include the plans and progress of various line agencies working in the municipality.

c. Accessibility and mobility data collection and analysis

Various data shall be collected to assess the accessibility and mobility conditions in the municipality. The consultant shall assess the status of public transportation service and also propose its development as a part of integral sustainable transport system. The collected information shall be used to assess the existing status and gaps in the provision of infrastructureand services.

d. Prepare indicative development potential map (IDPM)

The consultant shall prepare the Municipality's Indicative Development Potential Map (IDPM) according to the integrated urban development plan. The consultant shall add on the plans and programs on indicative development potential to update the maps and should be approved by the municipality.

e. Prepare inventory and map of municipal roads including trails and bridges

The consultant shall collect primary data on the existing condition of road including width, surface type, land use, etc. and prepare relevant maps of the inventory accordingly. The road network map shall be discussed with the wider audience through municipal level workshop. Socioeconomic data of all the requested linkages shall also be collected.

f. Collection of demand for new/upgrading/rehabilitation of transport linkages from wards

The consultant shall collect demand from each ward/settlement for new construction, rehabilitation or upgrading of various road linkages. The demand shall be collected in order of priority. The collected demand shall be screened, synthesized, synchronized and harmonized at municipal level through workshop.

g. Develop scoring criteria and its approval from municipality

The consultant shall mandatorily develop weight system for the scoring and prioritization criteria for screening and prioritization of roads in the network for all interventions. The scoring and prioritization criteria shall be approved by the municipality.

h. Road classification and nomenclature

The local road names should also be collected. The consultant shall prepare road classification criteria, propose metric system of road nomenclature and accordingly apply the same during data collection and inventory survey from field. The geographical code for Suryabinayak Municipality is 30704 where first digit "3" represents province, next two digits "07" represents Bhaktapur District and last two digits "04" represents Suryabinayak Municipality. The local road code should follow this code with Class name and road number.

i. Prepare perspective plan and map of interventions of services and facilities

The consultant shall prepare perspective plan of interventions of services and facilities, which are identified from the accessibility analysis and municipal level workshop. All the identified interventions shall be screened and rated on the basis of approved criteria. The consultant shall discuss with the municipality technical team and MRCC related to interventions of services and facilities for the improvement for the access situation. It should include (but not limited to) road maintenance and upgradation, construction of new tracks, public transport, road safety, etc. The final perspective plan of municipality roads will be developed. The perspective plan shall be shown in GIS maps.

j. Analyze fund availability for roads

The internal and external financial resources available in the municipality shall be reviewed by the consultant discussing with the municipality authority so that the financial resources available for the transport interventions during the five-year TMP period can be estimated. Sources of funding include annual budget allocated in the municipality, the budget allocated through GoN central and provincial agencies, etc. Other possible sources of funds could be

from road tolls, royalties, land taxes, etc. Prospects of funding from other external sources, including possible and committed funding from donors, are reviewed and shall be taken into account.

k. Preparation of Transport Master Plan (TMP)

The consultant shall prioritize intervention and road linkages for those interventions based on the perspective plan. The interventions shall be planned for the five-year period to be implemented annually. This shall be based on the cost estimates of maintenance, upgrading, rehabilitation and new construction of main trails, bridges, and roads.

l. Prepare a realistic physical and financial implementation plan of prioritized roads for the TMP period.

The consultant shall collect information on existing resources spent on transport infrastructure and possible available resources, and make a projection for the next five years' period. From the total projected resources, the consultant shall discuss with the municipality to find out the appropriate proportion to be spent on on-going roads and new interventions proposed. Based on the five-year projected funds availability the financial implementation plan shall be prepared. This step involves matching the estimated resources that are expected to be available to the municipality over the plan period, with the TMP period shall match with the projected available resources and should avoid proposing a long list for the TMP period.

m. Medium- and long-term planning

A medium- and long-term plan should be prepared in reference to the long-term vision of twenty years. The medium-term plan should address 10-year period and the long-term plan for 20 years. The short-term plan should be guided by the medium term and long-term plans.

1.4 Study Area

Suryabinayak Municipality situated in north-east part of Kathmandu valley in Province 3. Suryabinayak Municipality is one of the 4 newly declared municipalities in Bhaktapur district. It is located about 14 Km southeast of Kathmandu and lies between 85°29′38″ E and 85°21′36″ E longitude and 27°40′30″ N and 27°37′12″ N. latitude. Suryabinayak Municipality was declared on December 2014 merging four VDCs, Kautunje, Sipadol, Nankhel and Chitpol VDCs of Bhaktapur. And Anantalingeshwor Municipality was formed combining four VDCs Sirutar, Gundu, Dahikot and Balkot. Later in 2016 Suryabinayak Municipality was expaned including Anantalingeshwor Municipality. It is now divided into ten wards and the area covered by the municipality is 47.587 sq.km The highest altitude of the municipality is 2022 meters and lowest level is 1276 meters.

Table 1: Restructuring of wards of VDC to Municipality

Since 2016	2015- 2016	Before 2015	
Suryabinayak Municipality **(Present wards)**	Municipality	Former VDC name	VDC ward number
1	Anantalingeswor-6,7,8,9	Sirutar, Dadhikot	Sirutar-1,2,3,4,5,6,7,8,9 Dadhikot- 1,2,3
2	Anantalingeswor-1,2,3	Balkot	Balkot - 1,2,3,5,6
3	Anantalingeswor-4,5	Balkot	Balkot - 4,7,8,9
4	Anantalingeswor-10,11,12	Dadhikot	Dadhikot- 4,5,6,7,8,9
5	Suryabinayak-1,2,3,4	Katunje	Katunje - 1,2,3,4,5,6,7,9
6	Suryabinayak- 5	Katunje	Katunje- 8
7	Anantalingeswor-13,14,15	Gundu	Gundu-1,2,3,4,5,6,7,8,9
8	Suryabinayak-6,7,8	Sipadol	Sipadol-1,2,3,4,5,6,7,8,9
9	Suryabinayak-9,10,11	Nangkhel	Nangkhel-1,2,3,4,5,6,7,8,9
10	Suryabinayak-12,13,14	Chipotal	Chipotal-1,2,3,4,5,6,7,8,9

Source: Rajpatra

SECTION 2 STUDY METHOD

2.1 General Approach

It is said that high quality development plans lie at the heart of a high-quality planning system. Therefore, it is important to develop and upgrade a planning system with time to capture the change in the site condition and finding and advancement in the planning methodology and interpretation elsewhere. The planning approach has been changing over time with change in political status in Nepal over past 50 years. Such approaches have been studied. The approach as suggested by the ToR along with other approaches has been adopted to prepare the Municipal Transport Master Plan of Suryabinayak Municipality as discussed below.

The approach as suggested by ToR is participatory bottom-up approach and differs from conventional practices of trickle-down approach. Techno-political interface is incorporated in the planning process; active participation from representatives of political parties, line agencies, municipality officials and other stakeholders including the local people is crucial in the process and is ensured at different level through different methods such as data collection, key informant survey, case study, focused group discussions, public rapid appraisal, presentation, workshops and seminars.

Data based plan is prioritized through collection of available secondary data, and use of different methods and instruments to collect necessary primary data. The collected data will be used to reflect existing scenario and back the plans prepared, and its management will support any further planning effort in the future. The data collected reflects the overall scenario of the municipality and special/specific context of some local roads and settlements as well. For example the data on investment on road sector, socio-economy, travel pattern, vehicle ownership etc. will reflect the scenario of both specific settlements and the municipality as a whole.

Other approaches to provide complete streets, create liveable communities, smart city, identify and facilitate transit-oriented development, and sustainable development will be incorporated in the planning process through discussion with different stakeholders at different level. The discussions will be focused on the adaptability of such approaches in our local contexts. These approaches generally support the users and facilitate safe, comfortable and efficient movement of goods and movement with minimum impact of the environment and other users. It includes public transport routes, their connectivity, transfer stations and integration with other means of transport.

As a part of training and knowledge transfer, the municipality officials will be involved in data collection, planning and discussion on every level. This will help the municipality to understand the method of preparation of the plans and their interpretation. Better understanding of the plans prepared will help to implement the plans effectively and efficiently. Further, students and researchers in the field of transportation will be supported to conduct case studies, research and focused group discussion on local level. Participation of local youths and local stakeholders will be ensured. This will be facilitated through

coordination with technical institutions and, local clubs and committees. The municipal office will be directly involved in each stage of plan preparation including local, municipality and national level meeting, seminar and workshops. Such participation will ensure knowledge transfer of the planning process and its outcome to the concerned authorities. Broad discussion between the techno-political stakeholders on the plans and case studies from national and international practices and their local applicability will be organized to generate better plans and innovation in the local context.

The strategies and policies set out in the Transport Master Plan will provide the municipality the means to plan and manage a transportation system that supports the key development policies and objectives. It includes preparation of strategic transport network with regional and sub-regional divisions with the concept of regionalization. These regions are having nodes which are linked through the network to deliver services using regional strategies that can enhance the effectiveness and efficiency of service provision at regional level.

2.2 General Methodology

The detail method of study is presented in the flow chart below:

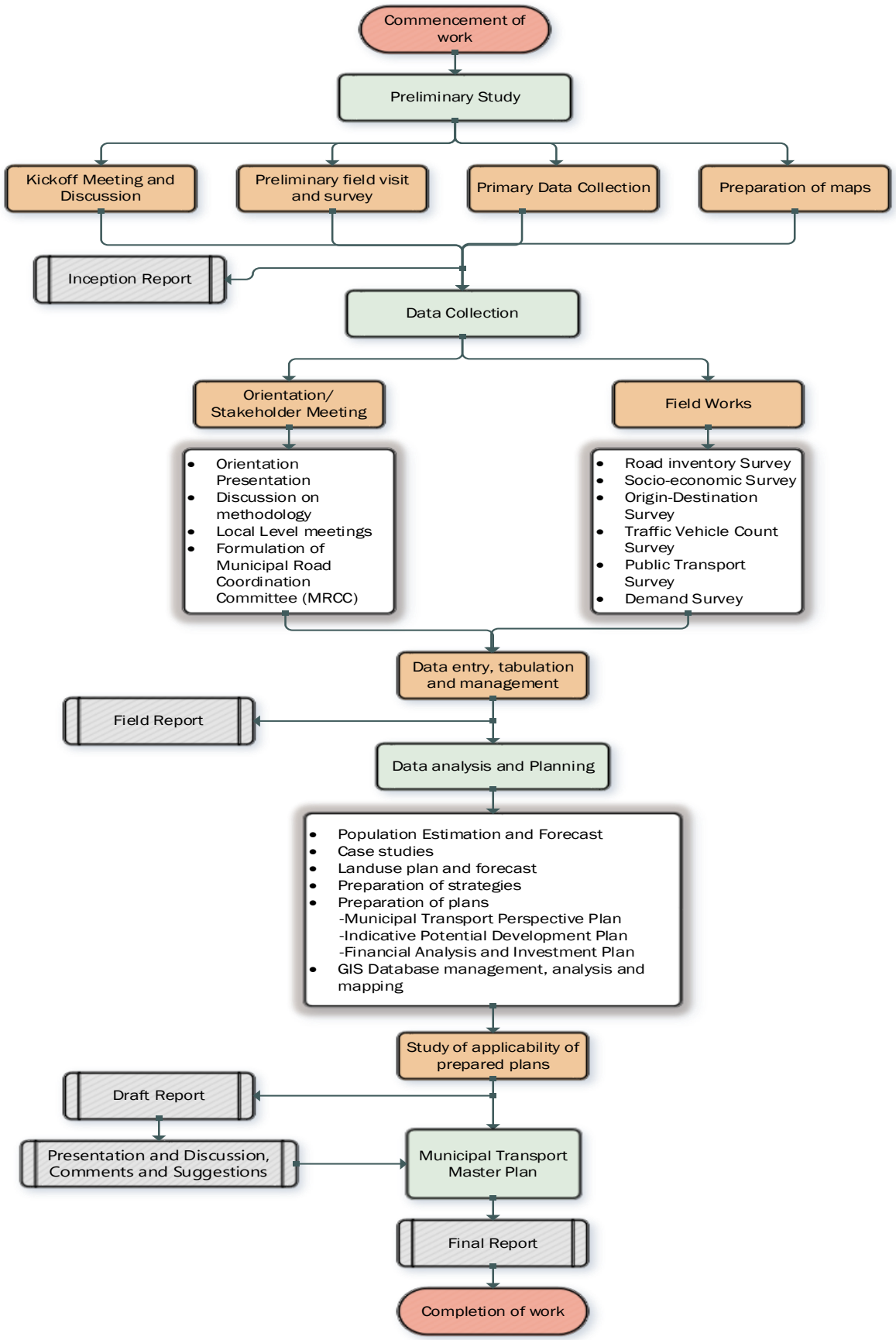


Figure 1 Methodology Flowchart

2.2.1 Preliminary study

2.2.1.1 Kick-off meetings

Expert team conducted a day-long presentation and workshop to clarify the village executive members and stakeholders about the holistic process of preparing MTMP.

2.2.1.2 Ward Level Meeting and Field Visits

Enumerators and surveyors were deployed in each ward for the required interactions with the villagers and for the collection of all necessary data on the existing condition of roads from the ground level at respective wards.

2.2.2 Data Collection

2.2.2.1 Primary Data

During the ward level meeting and after surveyors were deployed to collect all the necessary data viz. Road name, condition, length. Similarly, traffic count survey and O-D survey were conducted. All other relevant information was collected to prepare base map and IDPM which formed a groundwork for overall planning.

2.2.2.2 Secondary Data

These data were 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, tourism area, service centers (hospital, health post, agriculture service sub-center etc.). The 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, DDC, municipality etc. Digitized topographic maps, administrative map of municipality, strategic road network map prepared by DoR, etc. were some other secondary data that were used during the study.The following documents and sources were reviewed for the important data as the secondary data and information. Data Analysis

After collecting the necessary data, analysis was done to assess the existing condition of accessibility. It revealed the demands for the improvement as well as sustainable development of all transport infrastructure basically roads. Human settlement patterns, core road network and lack of roads are identified for the planning process. Analysis was done adopting the proven techniques, norms and standards.

2.2.2.3 Base Map with Indicative Development Potential Map

Base map is the foundation for all kinds of planning. Therefore base map was prepared with following information.

- Geo-political boundaries
- Land use or Land cover
- National Highways and Strategic Road Network
- District Road Network
- Bridges
- Important historical, religious, natural landmarks
- Water bodies, Watershed
- Elevation, aspect
- Major settlement, all settlement, urban centers, industrial areas
- Major touristic locations

Future development potential zones include: (IDPM)

- Areas with extensive agriculture and future expansion
- Areas with forest and future expansion
- Areas with business activities or marketplace
- Areas with touristic importance
- Areas with industry and future expansion
- Watershed areas
- Potential service sector expansion areas
- Areas with open space, recreation, stadium, parks, etc.
- Disaster prone area

IDPM was prepared based on the base map. IDPM indicates the future expansion areas where management of proper transportation system may become urgent according to the nature of the potential zones and volume of anticipated traffic after future expansion.

2.2.3 Preparation of MRIM (Municipal Road Inventory Map)

MRIM include a complete plotting of the roads within the municipality on the basis of the data collected from the ward levels. This map includes all the linkages with bridges and trails. It is a complete coverage of all the existing roads or like a profile of the roads or road networks. The roads are classified, codified, named and indicated on the map according to the above features with separate index.

2.2.4 Perspective Plan

Perspective plan covers the nature of the key interventions to be made upon the roads in the future in accordance to their importance and necessity. This plan is based on the data collected from the grassroots level. As a local government Municipality itself determines the requirements and demands from the ward levels and necessary interventions are recommended in accordance to the demands and necessity of the local people. Such required interventions are based on criteria 'B' of the approach Manual. This perspective plan is finalized after being approved by the Municipality.

2.2.5 Preparation of MTMP

After finalization of fundamental components like base-map, IDPM and perspective plan MTMP is prepared based on these components. MTMP rests on the following interventions types in one way or other. They are:

- New construction
- Upgrading
- Rehabilitation
- Recurrent Maintenance
- Periodic Maintenance

The consultant has prioritized the above interventions on the basis of interaction with the villagers and the necessity of the place and time. Availability of fund for the execution of the projects have been analyzed and five years projected financial plan devised. Target for the year and types of interventions have been finalized accordingly. After that report will be submitted for the approval from the village assembly.

SECTION 3 EXISTING SCENARIO (PROJECT AREA BRIEF)

The chapter deals with the present condition and scenario of the municipality based on various primary and secondary data sources. Socio-economic, trip, land use and transportation characteristics are basically deals in this chapter along with analysing accessibility and mobility scenario within the municipality. The basic data source of the analysis is the collected primary data.

3.1 Socio-economic and Demographic Status

Socio-economic and Demographic status refers to the present population, their distribution based on age, gender, caste, educational, occupational, income level and so on. Present and projected socio-economic and demographic status play a vital role in shaping the area. Population, household structure and their characteristics are some of the major pillars for better understanding of the locality.

3.1.1 Population Distribution

According to the Census 2021, the total population of the municipality is 140085 with 69915 male and 70170 female population. Total household in the municipality is 35865. The average household size is 3.91. The ward wise population distribution of the municipality is as shown in the table below.

Table 2: Ward wise Population Distribution

Ward	Total HH	Total Population	Male	Female	Area (Ha)	Population Density (pph)	Household Size
1	2595	10629	5292	5337	435.56	24.40	3.97
2	4762	17574	9007	8567	158.7	110.74	4.10
3	3439	13010	6608	6402	112.59	115.55	3.69
4	5231	20456	10244	10212	515.1	39.71	3.78
5	4955	19385	9589	9796	295.74	65.55	3.91
6	3894	14829	7215	7614	123.63	119.95	3.91
7	1739	7141	3529	3612	711.08	10.04	3.81
8	5813	22951	11408	11543	1091.94	21.02	4.11
9	1623	6709	3347	3362	806.84	8.32	3.95
10	1814	7401	3676	3725	507.51	14.58	4.13
Total	**35865**	**140085**	**69915**	**70170**	**4758.69**	**57.25**	**3.91**

As per 2021 population census, out of total wards, ward number 8 had the largest population 22951, while ward number 9 had least number of population with 6709. The ward number 8 had most households with total 5813, while ward number 9 had least number of households with total 1623 number of households. The population to household ratio was 3.91, which means that in average 3.91 family members lived in each household.

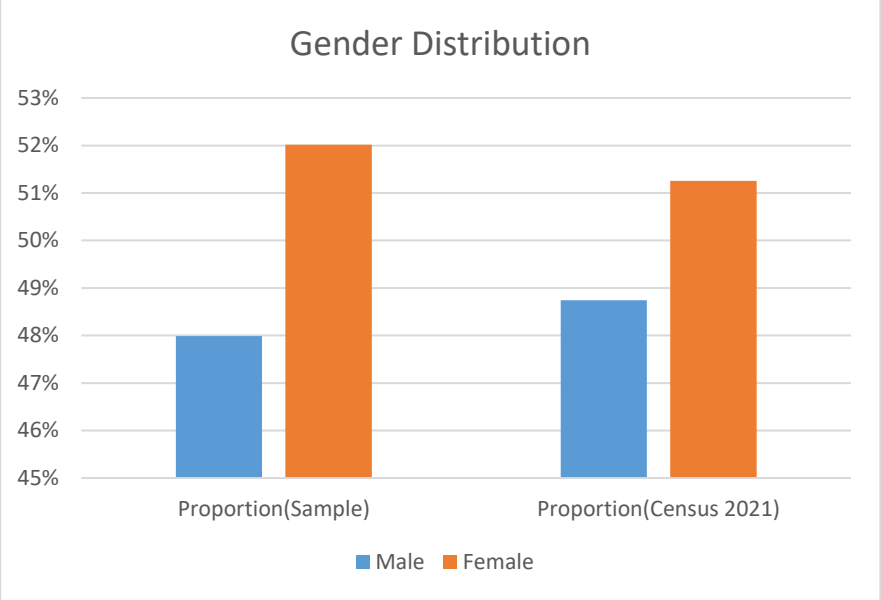


Figure 2 Gender Distribution

3.1.2 Occupation and Educational Status

The development status of the municipality is governed to large extent by the educational and occupational status. The educational and occupational status of the sampled population is highlighted in the subsequent charts respectively. Around 84% have completed or are perusing school level education and around 7.90% are still illiterate (Refer Figure 3.) The occupational status shows that most of the respondents were involved in services (24.32%), 24.09% respondent were student and around 0.91% are unemployed (Refer: Figure 4)

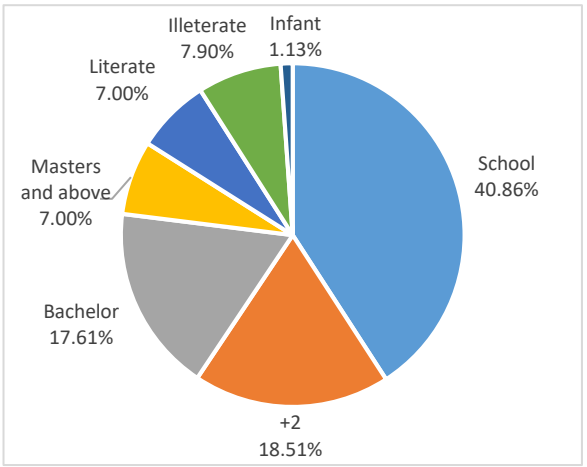


Figure 3: Educational Level Status

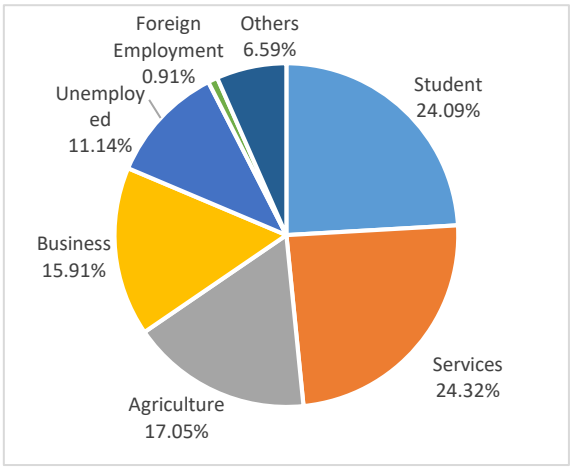


Figure 4 Occupation Distribution

The wardwise distribution shows that every wards have a large of share of population with school level education while Ward 6, 8, 9 and 10 have highest share of illiterate population.

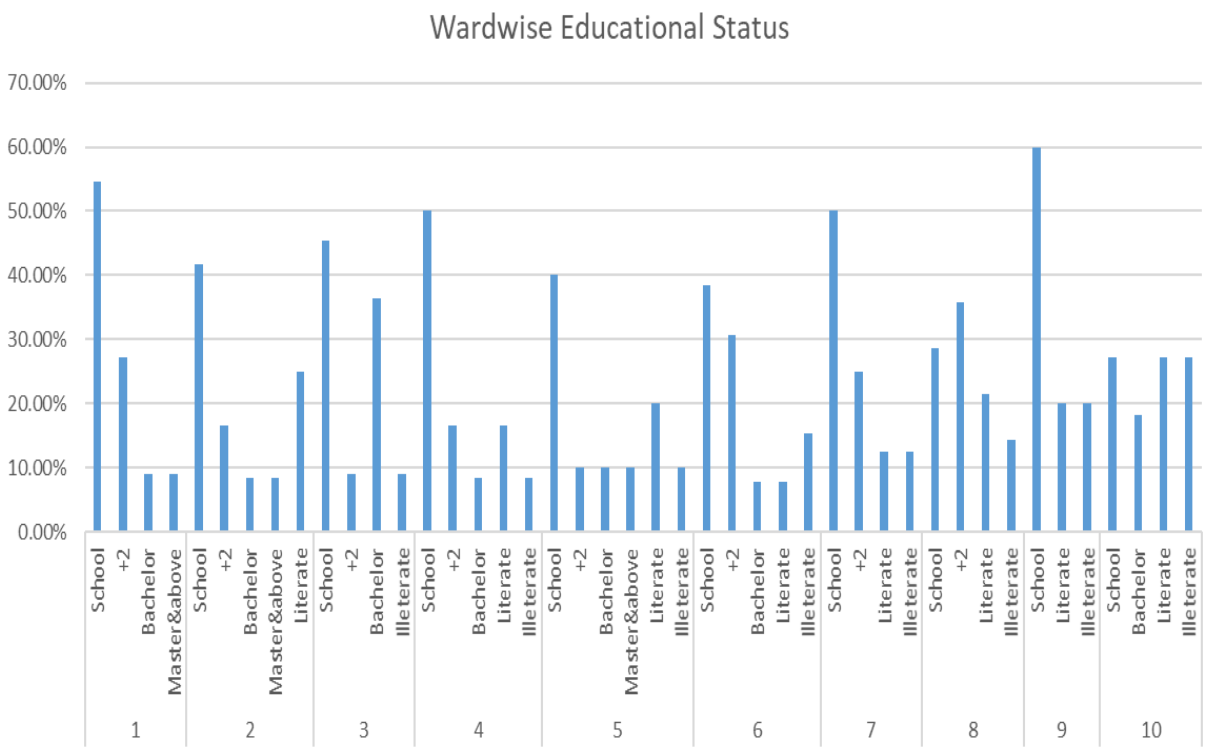


Figure 5 Ward wise Literacy Distribution

According to Figure 6, among the surveyed individuals, higher number of population are studying in school. Office workers and abroad generally have bachelors or masters education level and maximum people that are involved in farming have only studied up to school level. People who have their business also have school level education and people who have completed +2 level are still unemployed. Most of the illiterate population are involved in agriculture.

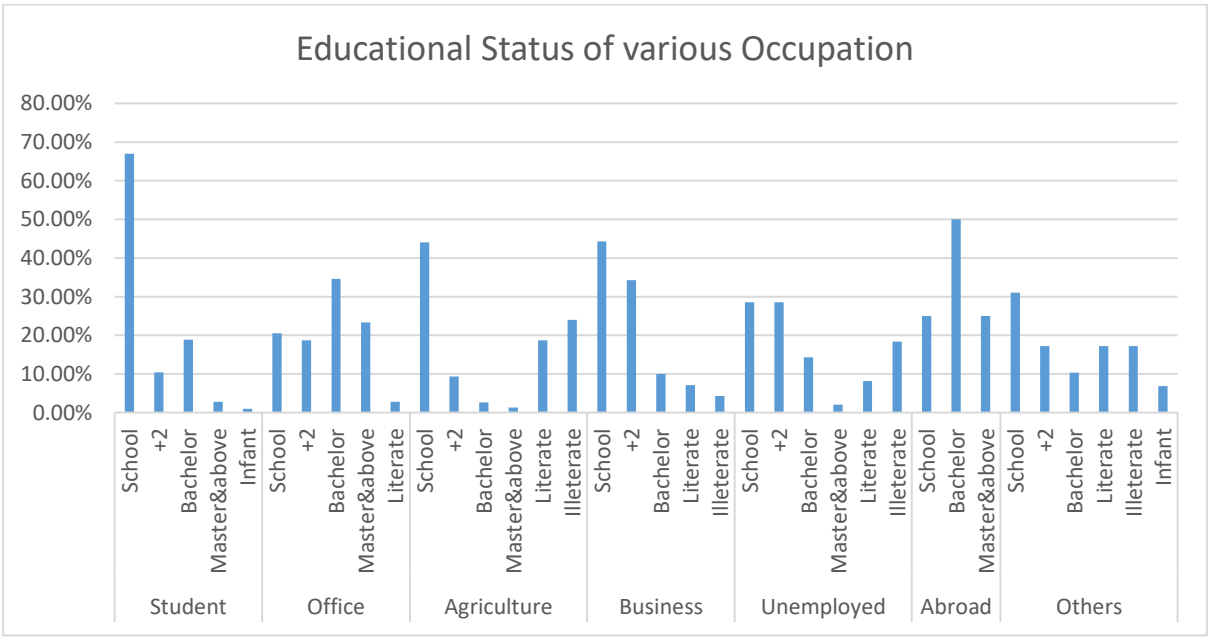


Figure 6 Educational Status of various occupation

The wardwise distribution in Figure 7 shows that agriculture and business are the most prominent occupation in the municipality. The population of ward 6 are actively involved in business while all the wards are more or less involved in agriculture. Unemployment can be seen as an issue in ward 1, 2, 3, 6, and 7.

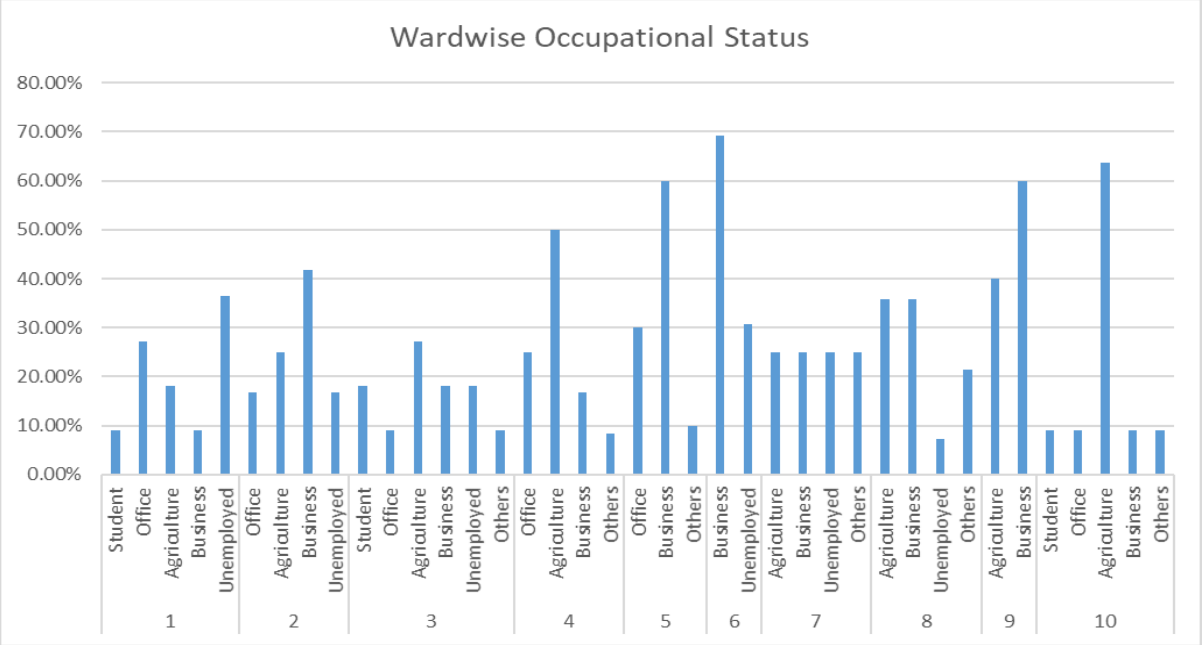


Figure 7 Educational Status of various occupation

3.2 Physical Scenario

3.2.1 Existing Land Use

The existing land cover shows that cultivable agricultural land covers 35.67% of the total area of the municipality and the forest covers about 21.19% of the total area.

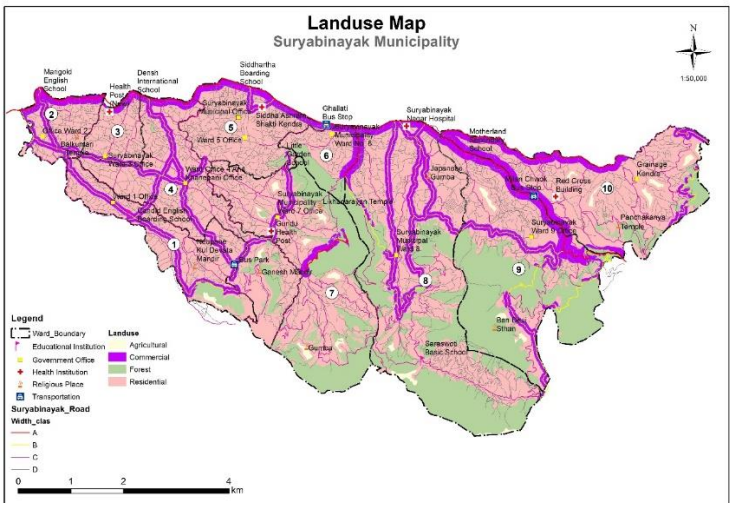


Figure 8 Existing Landuse of Suryabinayak Municipality

3.3 Road and Traffic

According to the strategic road network of 2011, the municipality consists of a total of about 15 km of National Highways, in which Arniko Highway consist of 9.528 km of Blacktopped roads and the NH38, Kathmandu Outer Ringroad which is proposed of 5.106 km, and 12 km of Feeder Roads and Strategic Urban Road of 0.476 km as shown in table below:

Table 3 Total Road length category-wise of Suryabinayak municipality

Class	Road Name	Blacktopped	Earthen	Gravelled	Proposed	Total
NH38	Kathmandu Outer Ringroad	-	-	-	5.106	5.106
NH03	Araniko Rajmarg (ARM)	9.528	-	-	-	9.528
F100	Sallaghari - Katunje - Lubhu	2.607	-	1.310	-	3.918
F099	Trolly Bus (ARM) - Suryabinayak - Bhujunge	3.175	-	4.227	-	7.401
F091	Kausaltar - Balkot - Sirutar - Biruwa	0.574	-	-	-	0.574
SUR005	Shrijana chowk(ARM)-DRO-KatunjeVDC	0.476	-	-	-	0.476

Key NH=National Highway; F=Feeder Road; SUR=Strategic Urban Road

Source: Department of Roads (Strategic Road Network), 2011

3.4 Overview of road inventory

All of the roads, among class A, B, C and D in Suryabinayak Municipality are gravelled (35.52%), blacktopped (48.79%), stone soling(0.71%), brick soling(0.25%) and block soling(0.66%) as shown in fig 9. The wardwise Surface type distribution shows that the the presence of blacktopped roads at ward 8 is high due to the presence of various infrastructures. Almost every ward have large proportion of gravelled roads. The presence of earthen roads at ward 4, 8 and 10 is comparatively high than other wards. The wardwise surface type distribution is shown in fig 11 below:

The road width distribution of municipal roads shows that about 76.89% of municipal roads are below 6m, 18.05% of municipal roads are of width 6 to 8m. Only about 1% of municipal roads are greater than 12m(Refer fig 10). Similarly, the wardwise road width distribution shows that almost every ward have equal proportion of road width of 6m. The wardwise road width distribution is shown in fig 12 below:

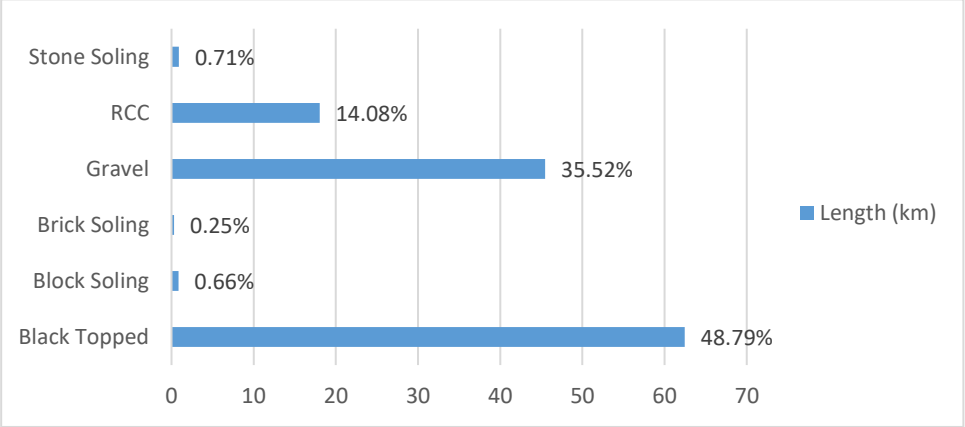


Figure 9 Surface Type Distribution

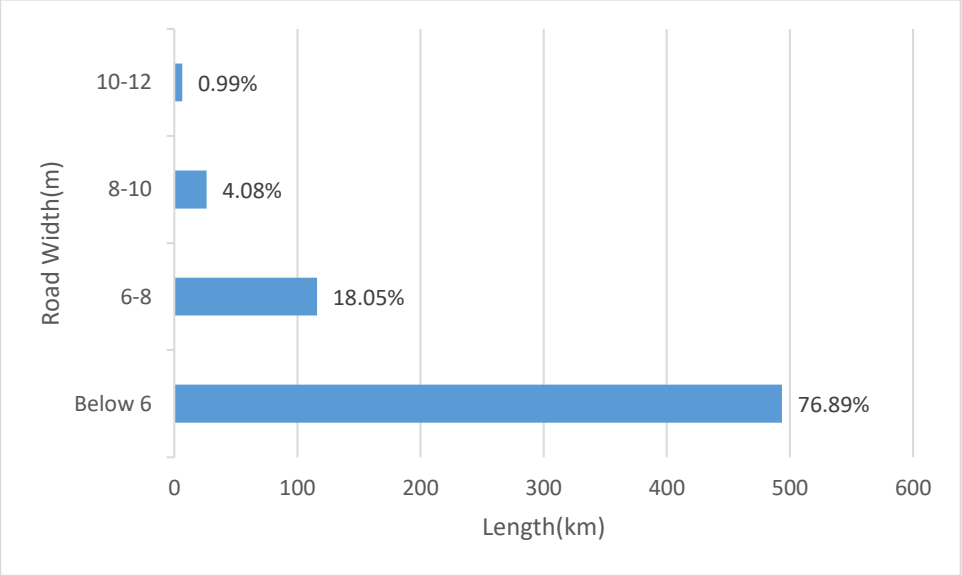


Figure 10 Road Width Distribution

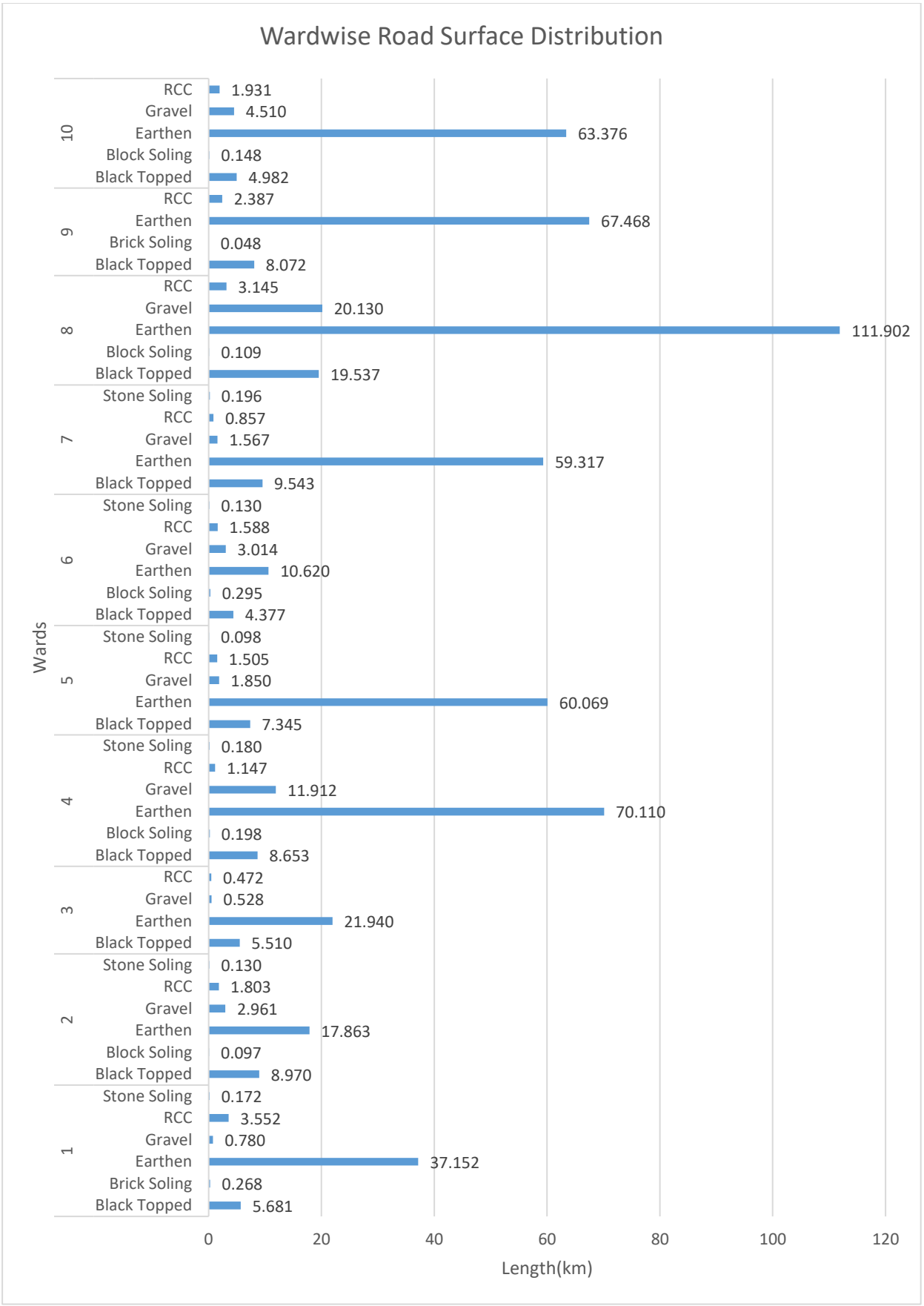


Figure 11 Wardwise Surface Type Distribution

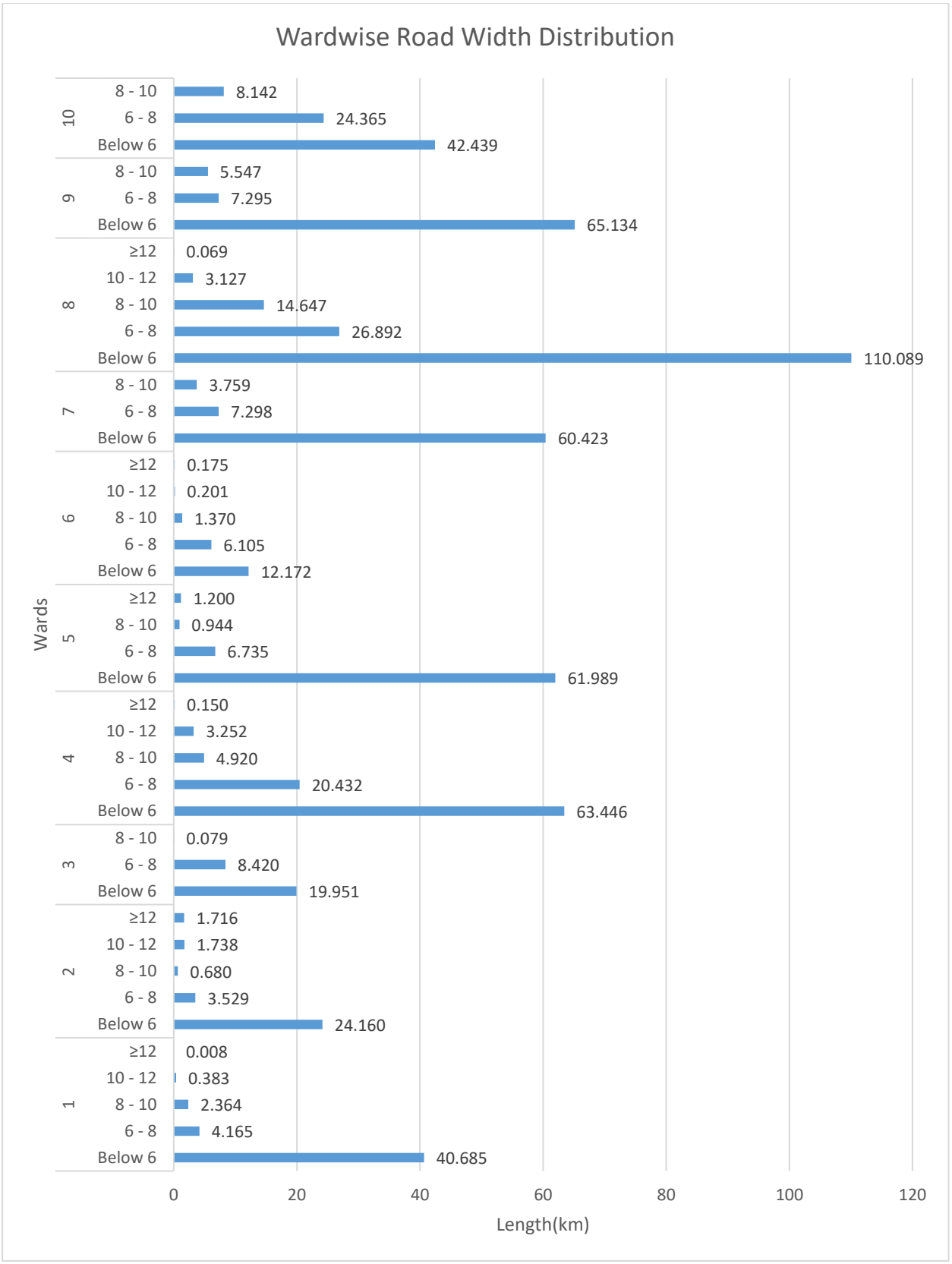


Figure 12 Wardwise Road Width Distribution

3.5 Road density

The road density per total area is highest for Ward 3 while it is highest for Ward 7 and 9. Another indicator would be the number of populations per km length of road. According to this, Ward 2 and 6 have the most population per sq. km while Wards 7, 8, 9 and 10 have the least.

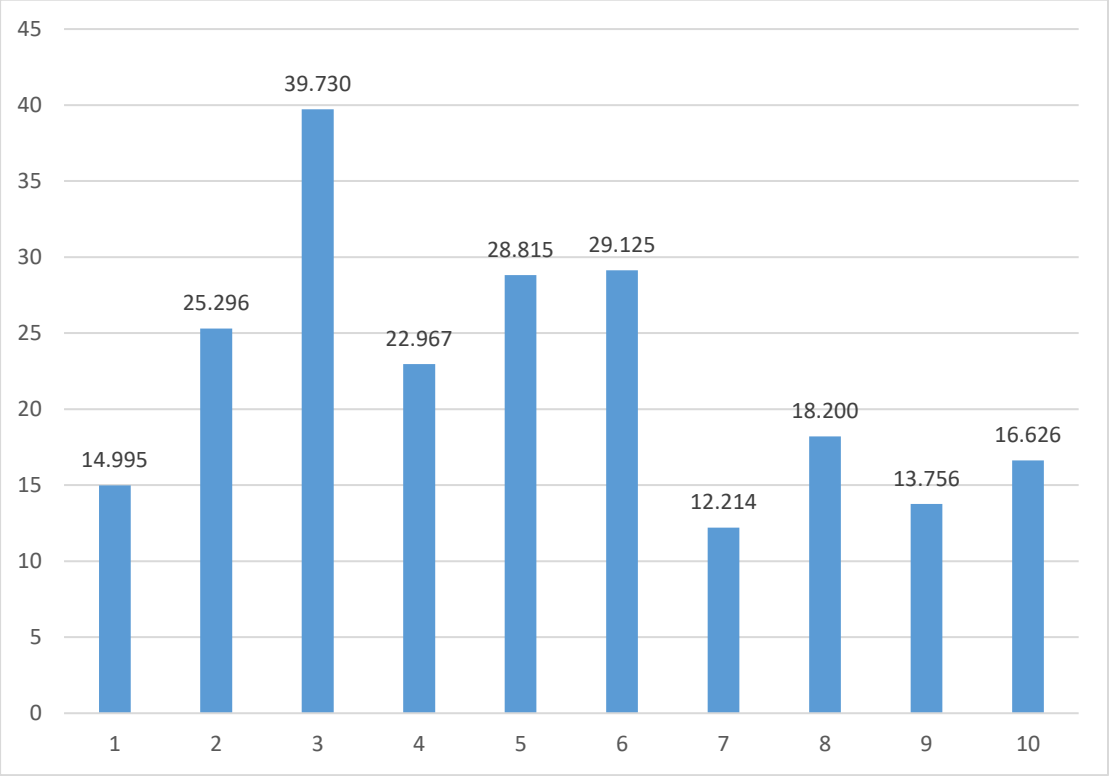


Figure 13 Wardwise Road Density per Total Area

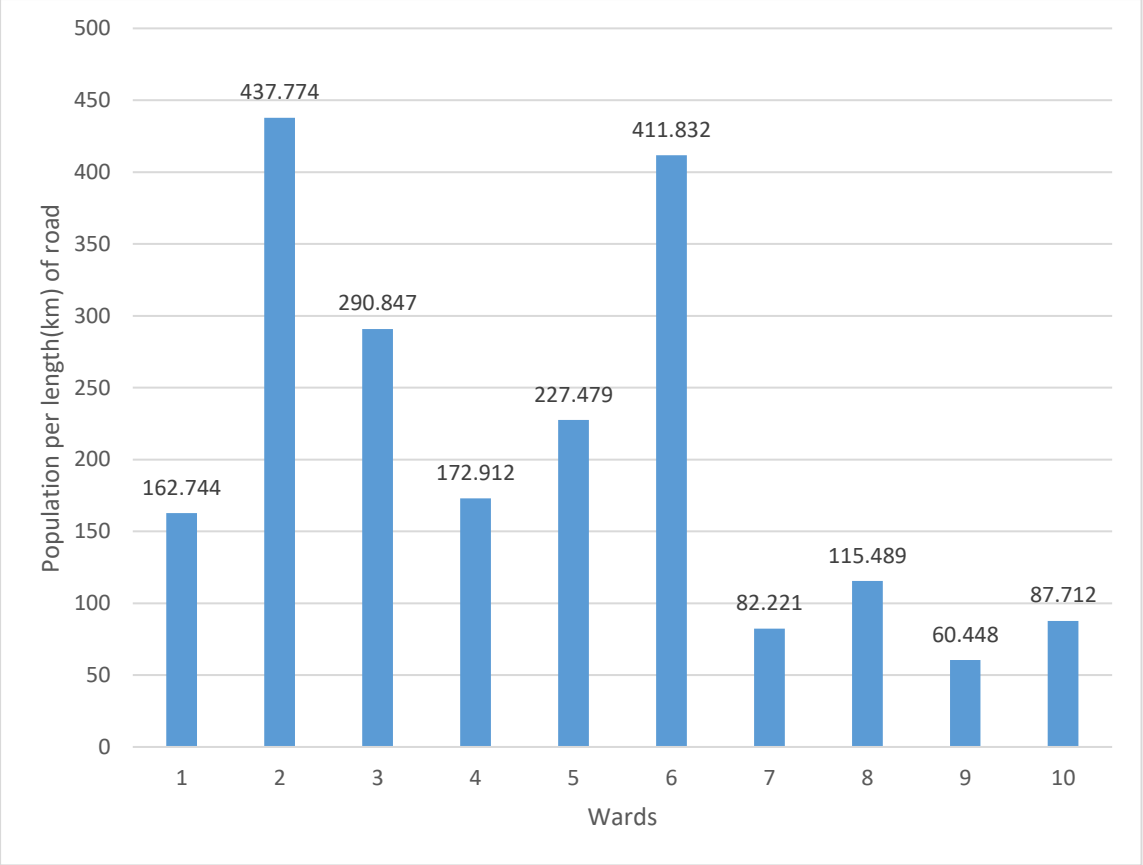


Figure 14 Population per Length of Road

3.6 Trip characteristics

Transport is demanded to fulfil other needs and services. *Transport is a service rarely in demand for its own characteristics* (Cole, 2005). Most individuals travel because they wish to benefit from the social, recreational, educational, employment and other opportunities which become accessible with movement. Similarly, *freight transport opens up opportunities for greater efficiency in production and permits extensive geographical specialization with the accompanying benefits of increased division of labour* (Elgar, 2002). The demand depends on the spatial distribution and location of various infrastructures such as educational institutions, market and business centres, customer service outlets, industries etc. The trips are characterized by the reason for which it is made, trip distance, the choice of available mode options, etc. The following data are based on the field survey conducted in the municipality.

3.6.1 Trip Purpose

From the survey performed, among the total daily trips most of the daily trips (about 30% were made by students to go to schools and colleges. Work trips are about 28%, with trips for shopping being 19%. Trips made for social/ recreational and business purpose were similar (about 9%) and farming with the smallest (2.8%).

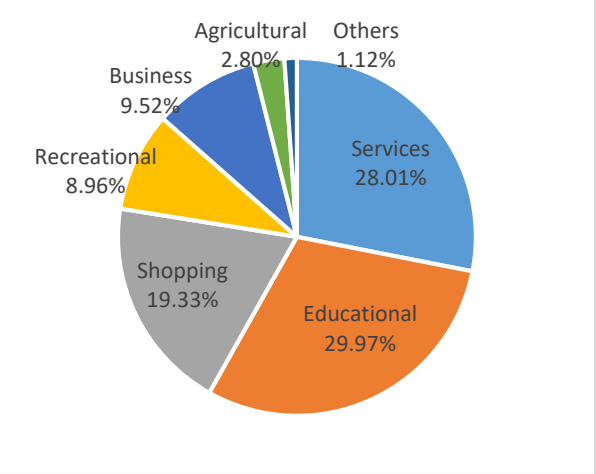


Figure 15: Proportions of Trip Purpose

3.6.2 Mode sharing

Out of the total trips made, most of the trips were made on bikes (35%) and by walking (34%). Use of public vehicles is also used actively (about 24%) while the use of cars and other vehicles are very limited. Most of the bike were used for work trips. Public transport (PT) is the most common mode for Business, education, work and shopping purpose.

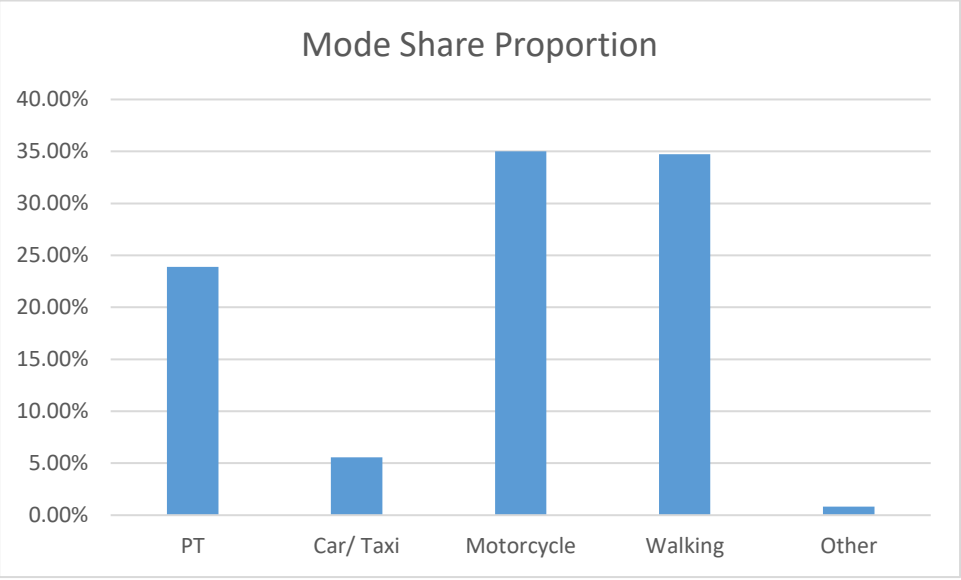


Figure 16 Mode Share Proportion

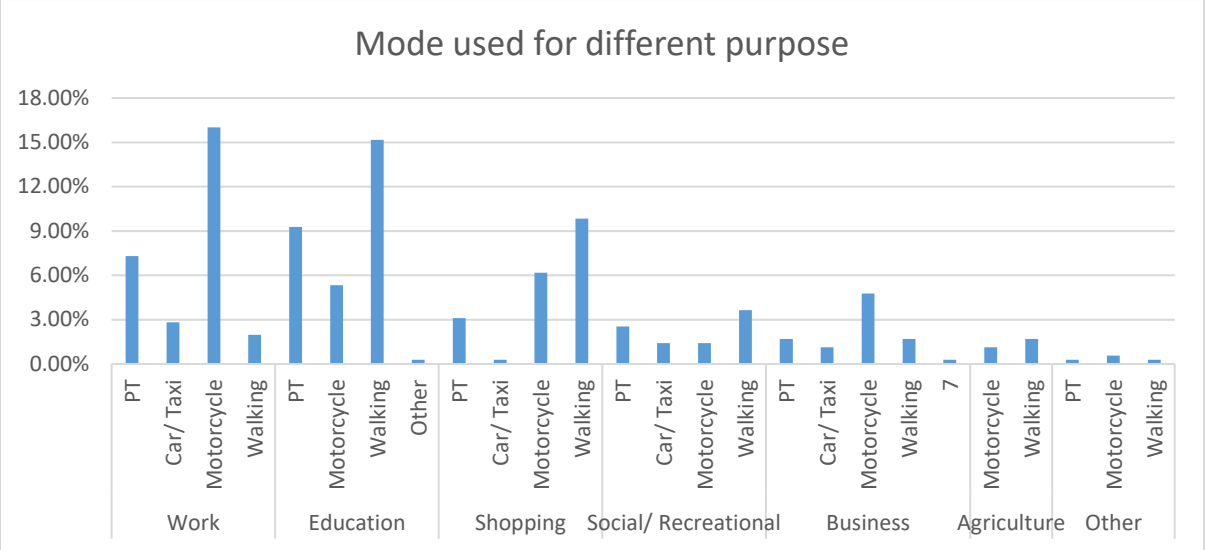


Figure 17 Mode used for different purpose

3.6.3 Trip destination

The major trip destination for the surveyed individuals was Balkot, Thimi, Suryabinayak, Jagati, Bhaktapur Durbar Square and Gamcha inside the municipality whereas Kathmandu is also one major trip destinations as it is a core area for educational and working purposes. Koteshwor, Baneshwor , Newroad, etc were the most travelled place in Kathmandu and trips to some places like Jawalakhel, Patan, Pulchowk , etc in Lalitpur were also made.

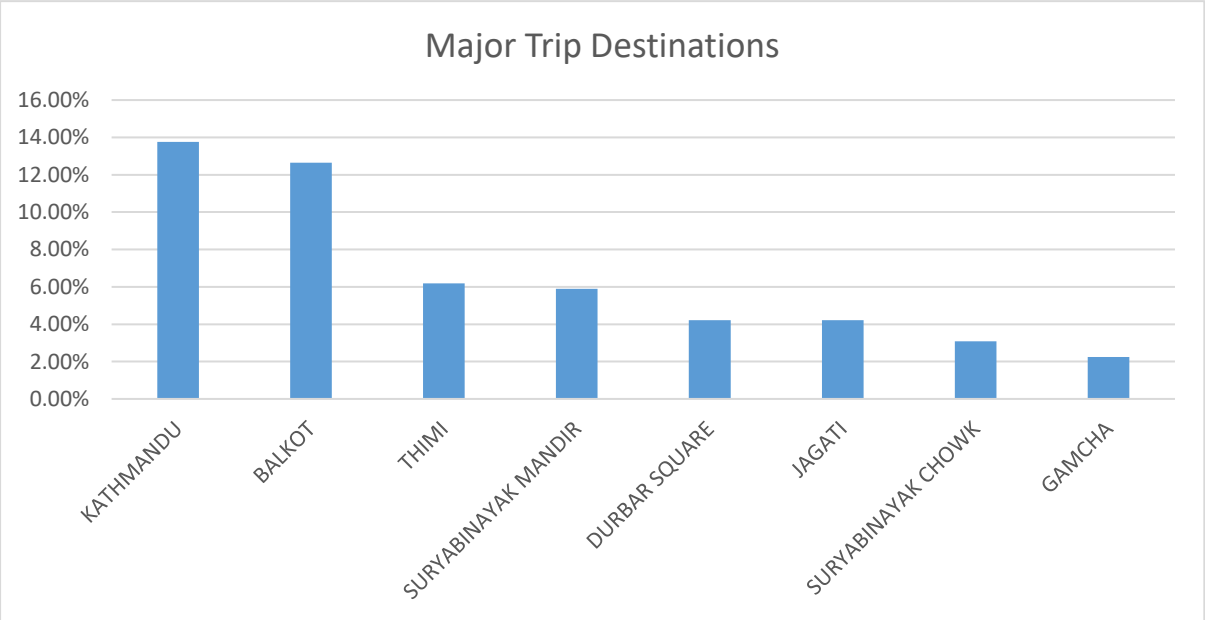


Figure 18 Major Trip Destinations

From figure 19, The major trips seems to be made to ward 2 and 7 while less people travel to ward 1,8 and 9.

Figure 19 Wardwise Destination

3.6.4 Trip duration

Both average and max time taken for travel are highest for social/ recreational purpose while the lowest was found to be for agricultural purposes.

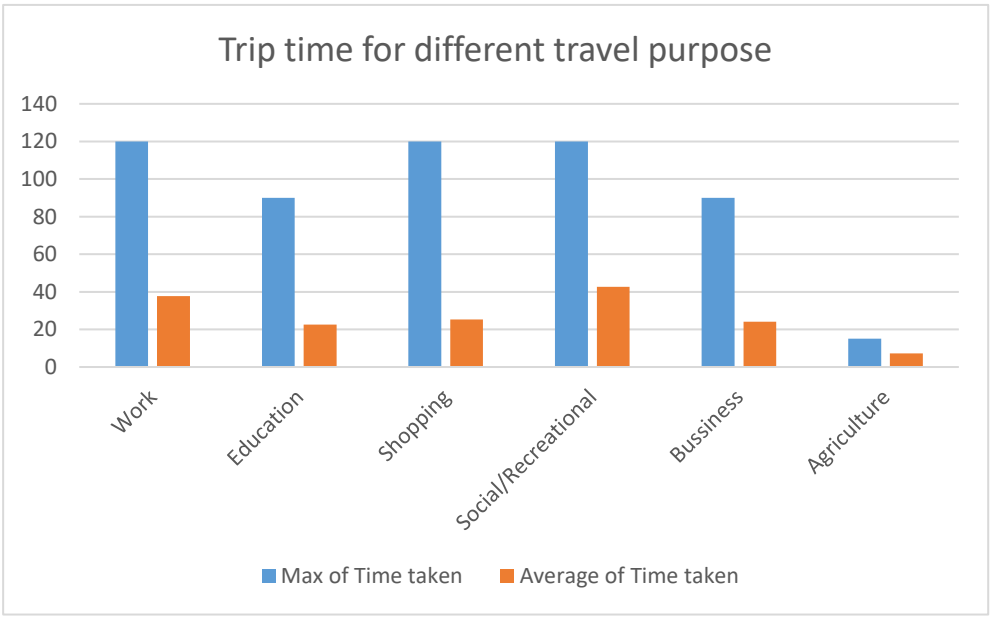


Figure 20 Trip time for different travel purpose

3.6.5 Vehicle Ownership

Vehicle ownership is one of the important indicators of socio-economy of settlements. Ownership of vehicles reflect the peoples lifestyles and influence the time taken to make the trips. According to the household survey, about 78% of the households have at least a motorbike while 11% possess at least a car, 6% possess a bicycle, and 6% possess other forms of vehicles such as tractor.

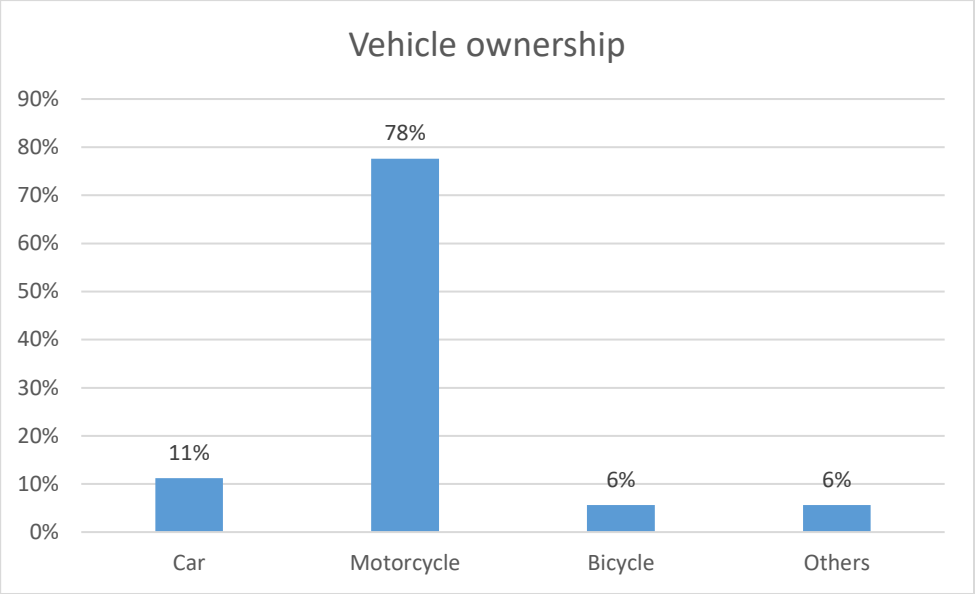


Figure 21 Vehicle ownership

3.7 Public transport

Public vehicle provides mobility to the general people. The accessibility of the roads does not necessarily guarantee mobility as many people do not have access to private vehicle. Comprehensive reach of public transport is thus important. Further, for sustainability in transport sector, the negative externalities associated with transport sector needs to be addressed. Most of the negative externalities include congestion, pollution, impact on health, etc. Public transport plays a vital role in reducing these externalities as public transport allows transport of higher number of people with lowlevel of emission and space use.

According to surveyed data, Wards 7 and 8 have the highest average time to reach nearest bus stop about 20-23 minutes while wards 1 and 2 have lesser average times to reach bus stops about 7-8 minutes.

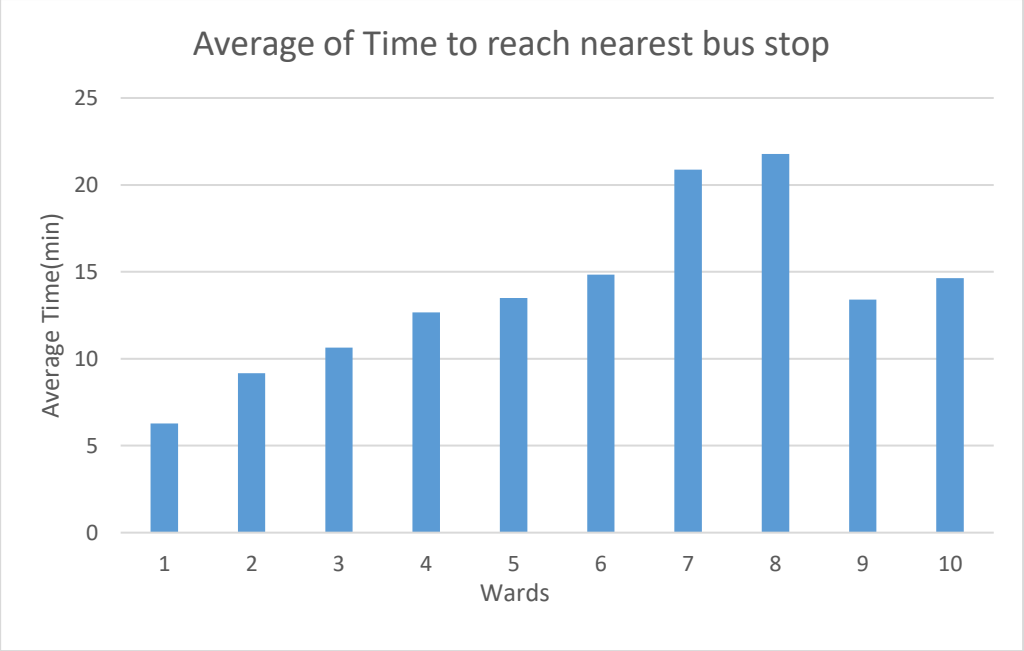
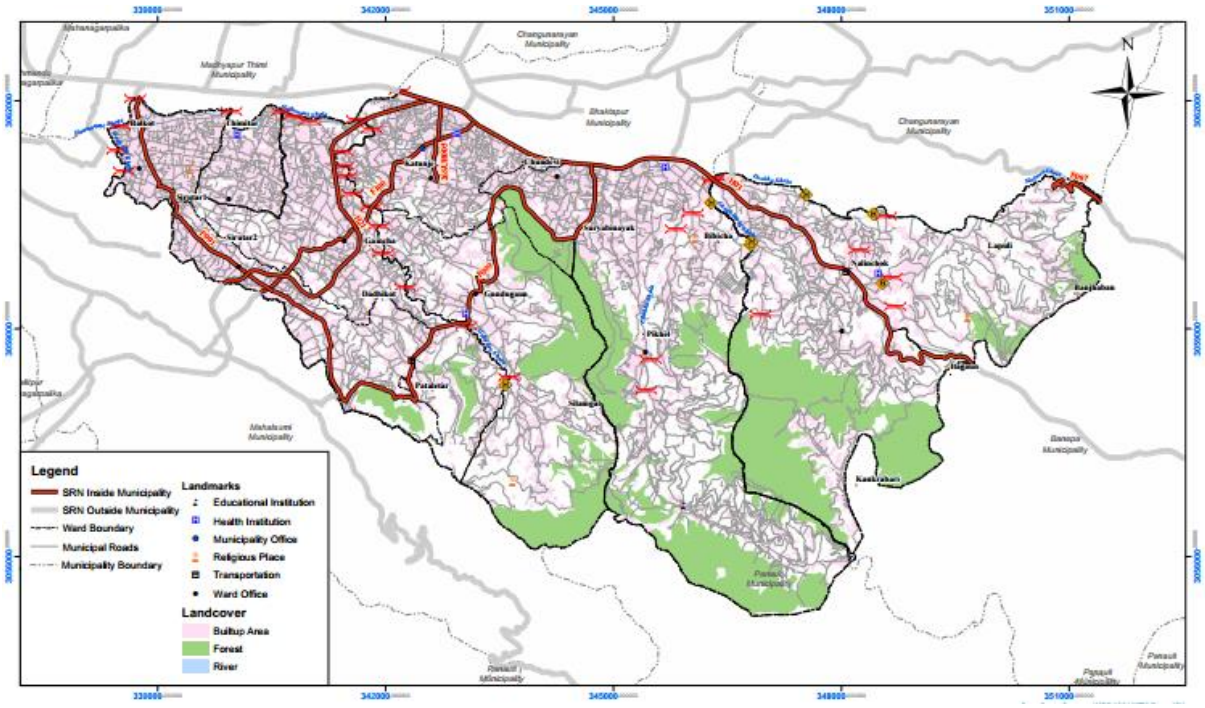


Figure 22 Ward wise Time to reach Bus Stop

3.8 Existing road hierarchy

The road network in Suryabinayak Municipality is composed of two national highways, three feeder roads, strategic urban roads, district roads, and local/municipal roads. The roads are categorised as strategic road network consisting of the highway and feeder roads. The Strategic Roads Network (SRN) are constructed and maintained centrally by the department of roads (DoR).



Map 1 Strategic Road Network Map

3.9 Buffer analysis

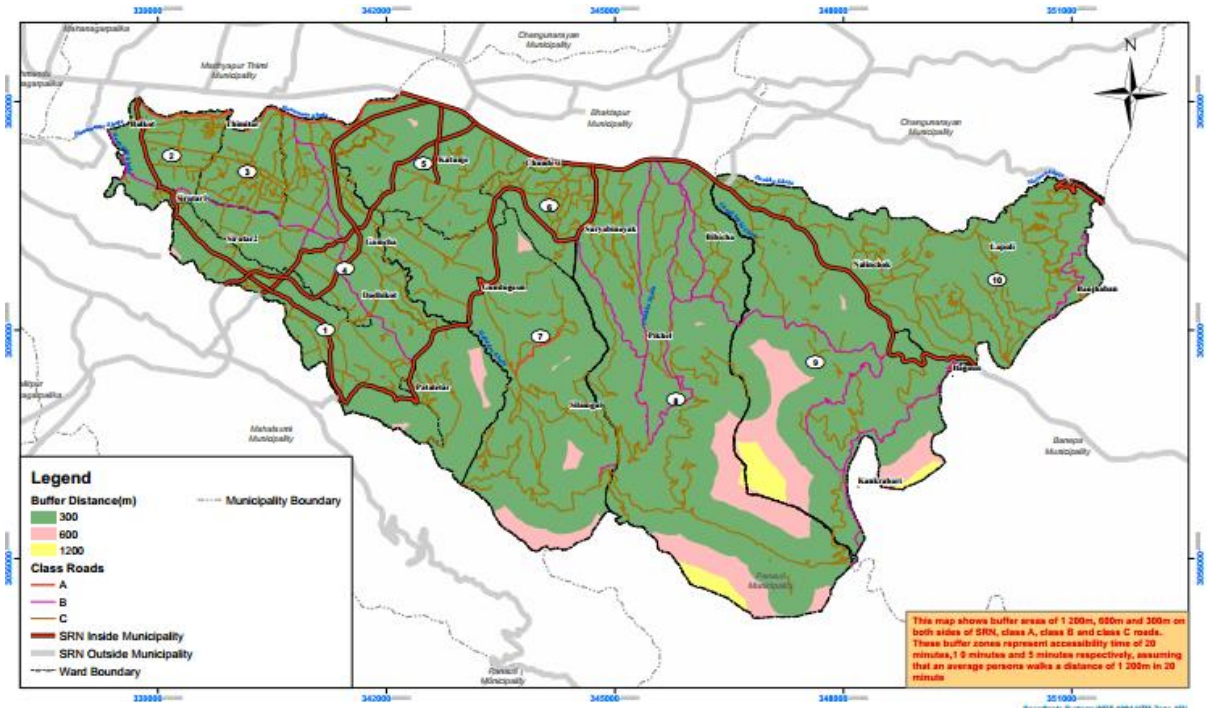
An analysis to assess the reach of the proposed road class in the municipality was conducted for Suryabinayak Municipality using the distribution of bus stops. As shown in the adjacent map, it can be seen that the proposed road classes cover full municipality area within a walking distance of 1200m. The results of the analysis can help inform government authorities and private sector service providersin planning and managing public vehicle services for better management of routes and allocation of bus stops/stations.

The buffer analysis was conducted using ArcGIS; the data for the analysis was the proposed road network of class A, B, C and the SRN. A walking distance of 300m, 600m and 1200m was considered assuming that an average person walks at a speed of 3.6 km/hr in the flat to moderately hilly terrain in the municipality.

The output of the analysis shows that all of the settlements will have access to the roads of at least Class C that will enable easily accessibility from the households to the road network. As shown in thetable below, about 92.53% of the total households will have access to the road within a walking distanceof 5 minutes. The remaining households will be able to utilize the roads within a walking time of less than 20 minutes.

Table 4 Buffer Analysis

S.N.	Time estimated (min)	Distance assumed(m)	Total Landcover (sq.km.)	Percentage cover
1	0-5	300	43.871	92.63%
2	5-10	600	2.919	6.163%
3	10-20	1200	0.572	1.207%
Total			**47.361**	**100.00%**



Map 2 Road Buffer Analysis Map

SECTION 4 MUNICIPAL TRANSPORT PERSPECTIVE PLAN (MTPP)

4.1 Perspective plan of transportation

Perspective plan of transport is a long-term strategic plan which sets the long-term objective, target and milestone for a focused direction of better coordination, guidance and harmonization of the investment for the prosperity of the municipality and development in the regional context. The MTPP gives a basic framework for the period of 20 years; a broad outline on how the transport sector should evolve and look like so that local and regional harmony on accessibility and mobility is achieved. The long-term perspective plan of Suryabinayak Municipality involves widening of the narrow roads whose RoW have already been fixed by the municipality building byelaws and implementation of traffic management strategies for safe, efficient and reliable transport infrastructure and services.

The long-term perspective plan is segregated into short term plan, medium term plan and long-term plan. The MTMP and MTPP should be revised every five years to update the plans based on changing scenario.

4.1.1 Short term plan

Short term plan refers to maintenance and upgrading of the existing road network to a specific standard that can support the present and recent future (5 years) demand. It will pave the way for well managed and better transport to be developed in the medium to long term. The short-term plan also includes construction of new roads to provide basic accessibility to settlements. The short-term plan gives a physical and financial implementation plan to implement the planned road network and services. The interventions are prioritized according to developed prioritization criteria and budget required/available.

The applied interventions in the short term maintains and generates demand for higher hierarchy roads with proposed infrastructures. The short-term plan in case of an urbanized area should pave the way to implement proper management plans in the future. This means, construction / upgradation of the existing roads to their full extent in the short-term plan.

4.1.2 Medium term plan

The medium-term plan is for the time period of ten years from year one to year ten. This period should formulate necessary policies, rules and guidelines, and plans to implement and enforce urban road discipline, pedestrian friendly infrastructure, environment friendly roads, differently-abled and age friendly roads, and sustainable infrastructures in the long term. The medium-term plan may also include piloting of such management plans which may include one-way roads, restricted vehicle uses at specific area, etc.

The best way to implement traffic management is to conduct comprehensive dialogue with the local residents and other stakeholders at local level to identify the actual users, their need and infrastructure gap. Based on local conditions and use, plans to divert thorough traffic,

reduce the average speed around residential area, educational institutions and hospitals should be formulated and administered.

4.1.3 Long term plan

The long-term vision of the municipality is to develop the road network to their proposed width withroads providing equitable opportunity of use for all sorts of users. The vision is to create a safe, equitable, sustainable transport network infrastructure and services to support people's mobility andmake the economy vibrant for social and economic prosperity. The policies prepared during the medium time period will pave the way towards implementing traffic and transport management plan at local level.

4.2 ACCESSIBILITY AND TRIP PATTERN

The ultimate goal of most transportation is "access," people's ability to reach desired goods, services and activities. Transportation decisions often involve tradeoffs between different forms of access. How transport is measured can have a major impact on these tradeoffs. Land use patterns affect mobility and accessibility in various ways:

1. Density (number of people or jobs per unit of land area) increases the proximity of common destinations, and the number of people who use each mode, increasing demand for walking, cycling and transit.

2. Land use mix (locating different types of activities close together, such as shops and schools within or adjacent to residential neighborhoods) reduces the amount of travel required to reach common activities.

3. Non-motorized conditions. The existence and quality of walking and cycling facilities can have a major effect on accessibility, particularly for non-drivers.

4. Network connectivity (more roads or paths that connect one geographic area with another) allows more direct travel.

There are many ways to measure transportation system performance, each reflecting particular perspectives concerning who, what, where, how, when and why. Different methods favor different types of transport users and modes, different land use patterns, and different solutions to transport problems. Vehicle traffic is easiest to measure, but this approach only considers a narrow range of transportation problems and solutions. Mobility is more difficult to measure, since it requires tracking people's travel behavior. It still considers physical movement an end in itself, rather than a means to an end, but expands the range of problems and solutions considered to include alternative modes such as transit, ridesharing, cycling and walking. Accessibility is most difficult to measure, because it requires considering land use, mobility and mobility substitutes, but most accurately reflects the ultimate goal of transportation, and allows widest range of transport problems and solutions to be considered. For example, an accessibility perspective may identify low-cost solutions to transportation problems, such as improving local walk ability; encouraging land use mix so common destinations such as stores, schools and parks are located near residential areas; and improving

communications services for isolated people and communities.

4.3 PROCEDURE FOR COLLECTING DEMANDS FROM WARDS

Ward level meeting in every ward or ward cluster is done where information on MTMP are collected. Demand form for each ward are provided which are later on collected after the form are duly filled in given time. As road demand from the settlement level is collected bottom up approach of planning is applied.

Data Analysis and Field Verification of the Roads from Demand

Form Analysis of data regarding the accessibility situation in each settlement, population forecasting for each sector, major road linkages will be done. Similarly, all the roads demanded in demand form are verified in field by the survey team. Details of ward demand has presented in Annex of the MTMP report.

4.4 Criteria for Prioritization and Score Distribution

Table 5 Prioritization Criteria Approved From Municipal Workshop

Scoring Criteria		**Scoring unit**	**Score**
Criteria No 1	Priorty by Ward Demand form		10
Criteria No 2	Class of Road specified as per MTMP study.		10
Criteria No 3	Existing Road Width		10
Criteria No 4	Population Serve by the Road		20
Criteria No 5	Recreational/Agriculture/Market Centre/Service Centre		10
Criteria No 6	Road Density		10
Criteria No 7	Settlement Density		10
Criteria No 8	Existing road Surface Type		10
Criteria No 9	Backward and poor ethnic		10

Table 6 Detail Score Distribution criteria

Criteria No 1	Priorty by Ward Demand form			
			Priorty	Marks
			1	100%
			2	80%
			3	60%
			4	40%
			5	20%
		>5 & 0	6	10%
Criteria No 2	Class of Road specified as per MTMP study.			
			Class	Marks
			A	100%
			B	90%
			C	80%
			D	70%
			other	0%
Criteria No 3	Existing Road Width			
	## Relative Marking Max-100%, 0-width 25%		Max width	100%
			0	25%
Criteria No 4	Population Serve by the Road		Max	100%
	Relative Marking		Min	0%
Criteria No 5	Recreational/Agriculture/Market Centre/Service Centre			
		Digit	4	100%
		Digit	3	80%
		Digit	2	60%
		Digit	1	40%
Criteria No 6	Road Density			
			Max	100%
			Min	50%
Criteria No 7	Settlement Density			
	Relative Marking		Max	100%
			Min	50%
Criteria No 8	Existing road Surface Type			
			Earthen	100%
			Gravel	80%
			Bituminous	60%
Criteria No 9	backward and poor ethnic			
			Max	100%
			Min	50%
			none	0%

4.5 GRADING AND NOMENCLATURE OF ROADS

Road network serve for direct access to the particular land-use by the provision of pedestrian footpaths, bicycle tracks, bus and vehicle routes and cater through traffic that is not related to

immediate land uses. Functional provisions of passenger and goods movement mainly define the hierarchy of roads and their classification. On the basis of this concept, roads are classified as per their function. Road class is related to the technical standard and functional requirements. Therefore, road classification should be based on its functional hierarchy. It is important to distinguish roads 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 instrument of road network and land use planning.

Figure 23Conceptual Hierarchy, Road Network Hierarchy, Urban Road Hierarchy

There are restrictions of direct linkage between various kinds of road-hierarchy. In other words, direct connections between certain types of road links should be reduced, for example residential streets and arterial roads. Connections between similar order streets should be made (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.). This conceptual framework can be seen from above Figure. These hierarchical distinctions of road types becomes more clear when considering the recommended design specifications for the number of through lanes, design speed, intersection spacing and driveway access.

A well-formed road hierarchy increases the performance and efficiency of the particular type of road as well as of the entire road network. Furthermore, it reduces overall impact of traffic by concentrating longer distance flow onto routes in less sensitive locations, ensuring land 40 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 concepts of road hierarchy assist in planning of overall road network and its transport services. Different hierarchy of road has different effect in surrounding areas and other roadways. Hierarchies of roads enable 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. Thus, a proper

plan should accommodate all users of the urban streets in planning, designing and construction of the road infrastructure and furniture. Municipality road network can be conceptualized by considering the functional hierarchy as arterial, sub-arterial and urban roads of various categories such as Class A, Class B, Class C and Class D.

Right of Way for Roads of different Classes:

The DTMP guideline has expected roads under category of National Highway (NH), Feeder Roads (FR) and District Roads (DRCN) within the Municipality area. The RoW of these roads are considered as per respective Guidelines. i.e the RoW of National Highways, Feeder Roads and District Roads are 50.0 m, 30.0 m and 20.0 m . The guideline has clearly stated about the setback distance for these roads (having RoW > 20.0 m) as 6.0 m on either side. All of these standards shall be applied to the Rural/Municipality accordingly.

Table 7 Urban Road Class and Features

<table>
<tr><th>Road Class</th><th>Description</th><th>Minimum RoW (m)</th><th>Minimum Setback Distance (m)</th></tr>
<tr><td>NH</td><td>National Highways</td><td rowspan="4">As prescribed</td><td rowspan="4">As prescribed</td></tr>
<tr><td>FR</td><td>Feeder Roads</td></tr>
<tr><td></td><td></td></tr>
<tr><td>DRCN</td><td>District Roads</td></tr>
<tr><td>A</td><td>Main Collector</td><td>14</td><td rowspan="4">2.0m (DTMP Guideline) and 1.5m (Building Guideline)</td></tr>
<tr><td>B</td><td>Other Collector</td><td>10</td></tr>
<tr><td>C</td><td>Main Tole Road</td><td>6</td></tr>
<tr><td>D</td><td>Other Tole Road</td><td>4</td></tr>
</table>

Based on DTMP guideline, the building line or setback shall be maintained 6.0 m for roads having RoW equal to or more than 20.0 m and 2.0 m for other roads. However Nepal Road Standards- 2070 has considered the setback distance at curved section only and that should be sufficient to provide the adequate sight distance. It is silent about the building line.

According to Fundamental Guidelines for Settlement Development, Urban Planning and Building Construction-2072 (2015 AD), the minimum setback distance for urban roads as 1.5 m on either side. Again, the minimum of Row of roads has set as 6.0 m. i.e. 3.0 m on either side form the centerline. A portion of this guideline has presented herewith.

Urban Road Classification

Roads under jurisdiction of Municipal authority are referred as urban roads. The classification practices of urban roads basically are guided by the functional hierarchy of roads. In the context of Nepal, Department of Roads (DoR) has classified urban roads as Arterial, Sub-arterial, Collector and Local/Residential Street in its Urban Road Standard 2068 (draft). The ToR provided for the preparation of MTMP has formulated the class of roads into A, B, C and D.

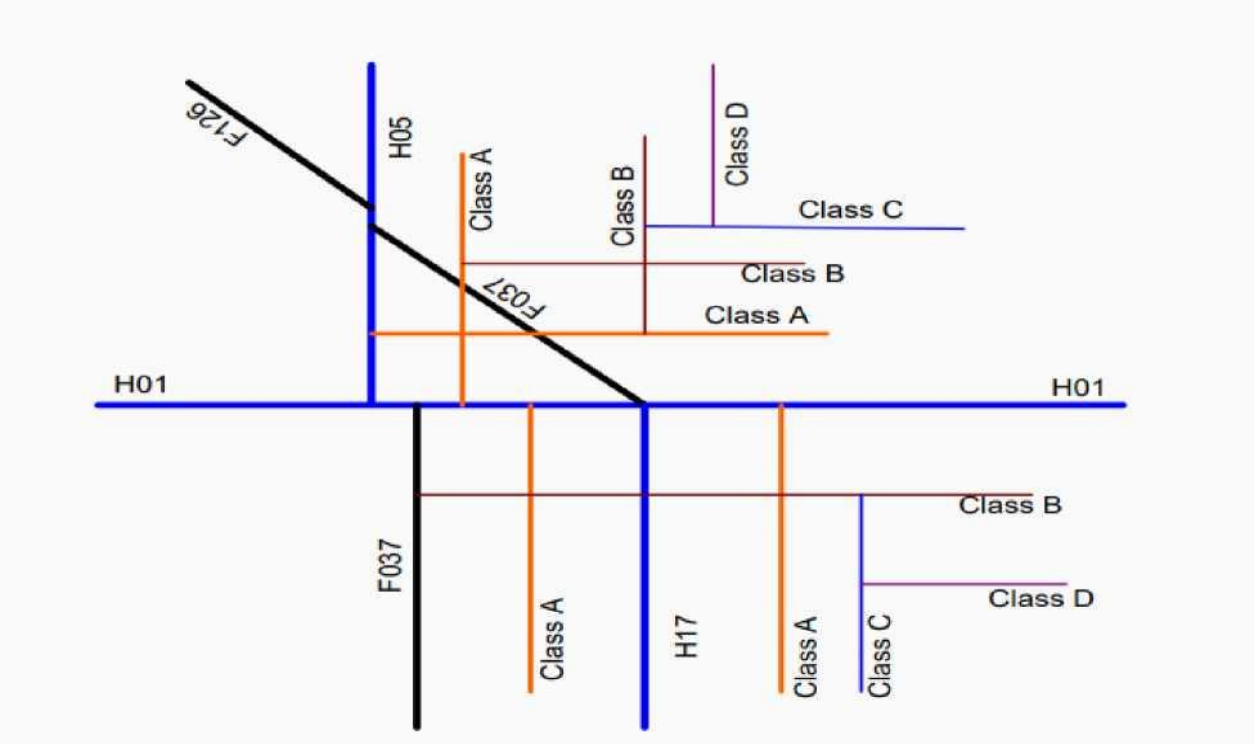


Figure 24 Detail description of road class

The fundamental parameters of the urban road are shown in Table 12. Municipality has a complete road network hierarchy consisting of National Highways, Feeder Roads, District Roads and Urban

Roads of all four classes. The conceptual layout based on the functional hierarchy of the entire road network is shown in Figure above.

National Highways

Arterial roads in Municipality are taken as the links of National Highways. The technical standards of these roads are taken from the DoR directives for Right of Way (RoW) and other features.

Feeder Roads

Feeder roads are taken as the sub-arterial road in Municipality. The technical standards for

this category are taken as mentioned by the DoR road Standard. These roads have relatively higher traffic with through movement of local vehicles.

Class A Roads

Class A roads serve as the major collector roads. These roads start either from the Arterial or Sub- Arterial road. These roads are of relatively long distance which connect big market or settlement areas or two or more wards centers within the Municipality.

Class B Roads

Class B roads are of secondary type of collector roads. These may serve as the collector to the Class A roads with the relatively lower geometric standard. Intersection and other parameters may be taken as similar as Class A roads.

Class C and Class D Roads

Class C roads are residential street and they provide access to the private property and small industrial or public place. These roads serve mainly for small/light vehicular movement for low volume intensity. If these roads connect one or more residential blocks then they are taken as Class C. If they collect from or end to the single residential block then they are referred as Class D roads. These serve for internal traffic movement within the area.

Coding of Municipality Roads

All road links within the Municipality are given unique code number consisting of ten digits. The coding system for particular road link is described below:

First Code M represents for the Municipality.

First digit (3) represents the number of Province.

Second and third digits represent particular district .Bhaktapur District is coded by 07.

Fourth and fifth digits represent particular name of the Rural/Municipality in the district. Suryabinayak Municipality is coded by 04.

Seventh code indicates letter A to D for particular Class of road.

Next three digits (001 to 999) represent the particular transport linkage. After all the code numbers, road name is written.

An example of the code number and road in Dharmadevi Municipality is shown as

M	3	0	7	0	4	A	0	0	1

Typical Cross Sections of Municipal Roads

The existing transport linkages (except the Strategic Road Network (SRN) linkages) within the Municipality are referred as Municipal Roads. These roads have been classified based on their functional hierarchy. Geometric features of these roads may vary as per the availability of Row and roadside land-use pattern. Typical cross-sections of these roads have been described below.

Road Class A (Main Collector)

These roads are major transportation corridors within the Municipal territory. These roads are assumed to have higher traffic and they pass through along the east to west or north to south the Municipal area. Further, these roads connect major settlements or market areas within the Municipality. Functionally, these roads collect the traffic from major settlements, tourist area to the SRN linkages. As per the available RoW and land-use pattern typical cross-sections may be selected as shown in Figure below. Minimum RoW for class A road is 14 m.

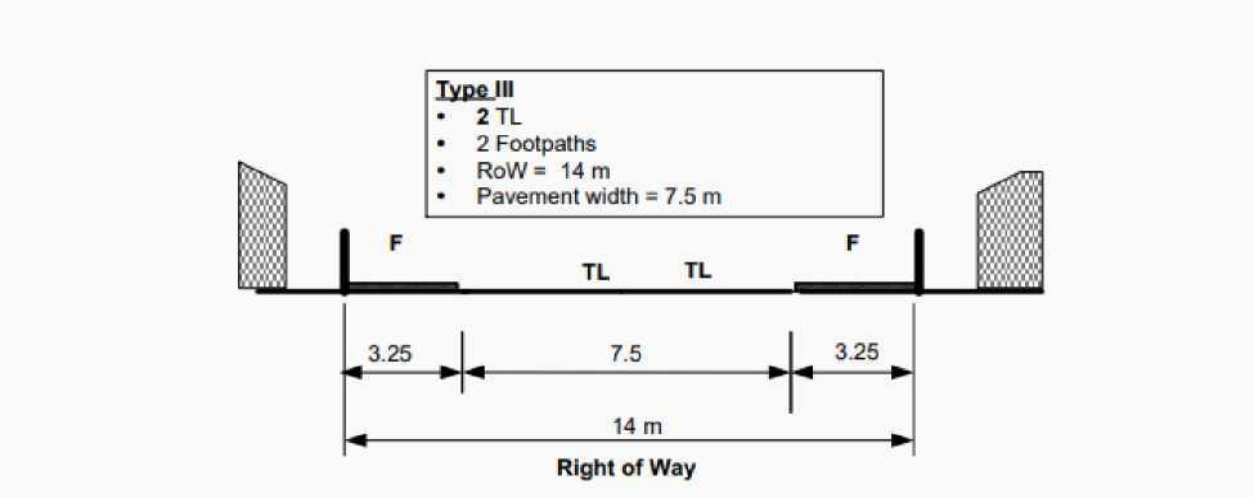


Figure 25 Typical Cross-section for Class A Roads (with RoW 14 m)

Table 8 A Road List

S.N.	Road Code	Road Name	Length (Km)
1.	M30704A001	Hanumante Khola Corridor	3.92
2.	M30704A002	Parthivara Tamang Tole Manthali Road	0.99

Road Class B (Other Collector Roads)

These roads serve as collector road from relatively small settlements and having less traffic flow. The minimum RoW for such class of roads is 10 m. The typical cross section with the minimum RoW is shown below.

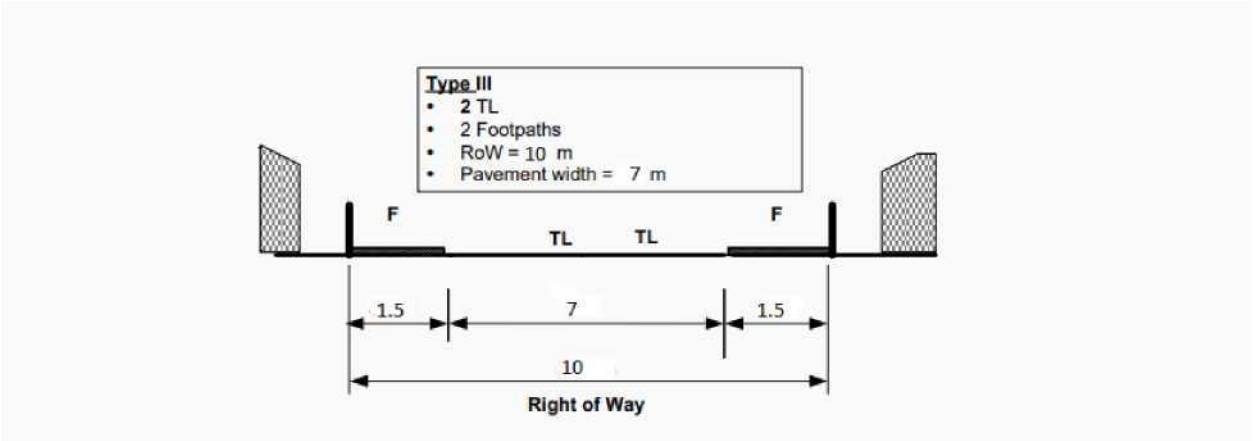


Figure 26 Typical Cross-section for Class B Roads (with RoW 10 m)

S.N.	Road Code	Road Name	Length (Km)
1	M30704B001	Dagacha - jhyali pati - Bhattarai tole	2.163
2	M30704B002	jagati police headquater - thulo gaun --pati	2.029
3	M30704B003	NH34-Mahatgaun-Nangkhel-Dandagaun-	10.663
4	M30704B004	Pikhel-Chakhu-NH34	2.679
5	M30704B005	Palase-Kankrbari-Aarapari-Sanikot	4.382
6	M30704B006	NH34-Itagaun-Kankrabari	2.981
7	M30704B007	Kabrepalanchowk-Banjhaban-Kabreplanchowk	2.133
8	M30704B008	Majhgaun Sadak	1.123
9	M30704B009	Godawari Khola-Ranikot	0.523
10	M30704B010	Godawari Khola corridor	0.565
11	M30704B011	F091-Ranikot-Chitrapur-F100	2.419
12	M30704B012	Thimi- Harsha Chowk-Gamcha - Tharkhagal	1.975
13	M30704B013	Altara Chowk-Chitrapur Sadak	0.689
14	M30704B014	Thimi gamcha tarkhal Road	2.067

Road Class C (Tole Roads)

These types of urban roads are for the purpose of residential access. Residential streets are designed for the lower traffic volume, especially private transport. Therefore, RoW for this class of roads is designed for single lane pavement. Minimum RoW strip for such class of road is 6 m. Typical cross-sections as per the available RoW are shown in Figure below.

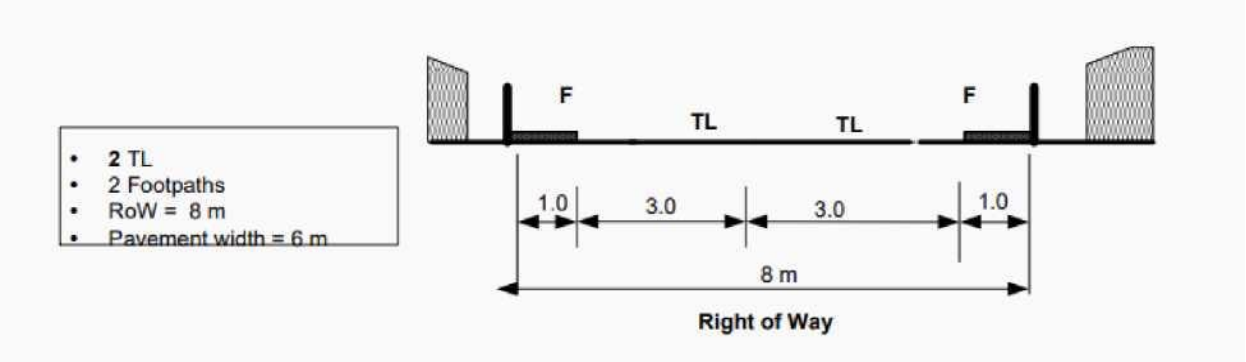


Figure 27 Typical Cross-section for Class C Roads (with RoW 8m)

Table 9 Summary list of A,B, and C roads

SN	Municipal Code	Class	Road Name	Wards Passed	ROW (in m)	Length (in km)
1	M30704A001	A	Hanumante Khola Corridor	2, 3, 4, 5	>14	3.92
2	M30704A002	A	Parthivara Tamang Tole Manthali Road	7	>14	0.99
3	M30704B001	B	Dagacha - Jhyali pati - Bhattarai tole	8	10-14	2.16
4	M30704B002	B	Jagati police Headquater - Thulo gaun --Pati vangyang	8	10-14	2.03
5	M30704B003	B	NH34-Mahatgaun-Nangkhel-Dandagaun-Doreshwor-Magargaun-Gunchadol-F099	6, 7, 8, 9	10-14	10.66
6	M30704B004	B	Pikhel-Chakhu-NH34	8	10-14	2.68
7	M30704B005	B	Palase-Kankrbari-Aarapari-Sanikot	8, 9	10-14	4.38
8	M30704B006	B	NH34-Itagaun-Kankrabari	9	10-14	2.98
9	M30704B007	B	Kabrepalanchowk-Banjhaban-Kabreplanchowk	10	10-14	2.13
10	M30704B008	B	Majhgaun Sadak	10	10-14	1.12
11	M30704B009	B	Godawari Khola-Ranikot	2	10-14	0.52
12	M30704B010	B	Godawari Khola corridor	2	10-14	0.56
13	M30704B011	B	F091-Ranikot-Chitrapur-F100	2, 3, 4	10-14	2.42
14	M30704B012	B	Thimi- Harsha Chowk-Gamcha - Tharkhagal	4	10-14	1.97
15	M30704B013	B	Altara Chowk-Chitrapur Sadak	4	10-14	0.69
16	M30704B014	B	Thimi gamcha tarkhal Road	1, 4	10-14	2.07

SN	Municipal Code	Class	Road Name	Wards Passed	ROW (in m)	Length (in km)
1	M30704C001	C		9	6-9.99	2.64
2	M30704C002	C		8, 9, 10	6-9.99	1.79
3	M30704C003	C		10	6-9.99	0.52
4	M30704C004	C		9, 10	6-9.99	0.39
5	M30704C005	C		10	6-9.99	2.27
6	M30704C006	C		10	6-9.99	1.52
7	M30704C007	C		10	6-9.99	1.03
8	M30704C008	C		10	6-9.99	1.21
9	M30704C009	C		10	6-9.99	0.96
10	M30704C010	C		7, 10	6-9.99	1.81
11	M30704C011	C		10	6-9.99	0.45
12	M30704C012	C		10	6-9.99	1.07
13	M30704C013	C		10	6-9.99	2.38
14	M30704C014	C		10	6-9.99	0.62
15	M30704C015	C		10	6-9.99	3.33
16	M30704C016	C		10	6-9.99	0.62
17	M30704C017	C		10	6-9.99	0.37
18	M30704C018	C		10	6-9.99	1.96
19	M30704C019	C		10	6-9.99	0.80
20	M30704C020	C		10	6-9.99	0.55
21	M30704C021	C		10	6-9.99	0.30
22	M30704C022	C		10	6-9.99	0.70
23	M30704C023	C		10	6-9.99	0.35
24	M30704C024	C		10	6-9.99	0.16
25	M30704C025	C		10	6-9.99	0.83

SN	Municipal Code	Class	Road Name	Wards Passed	ROW (in m)	Length (in km)
26	M30704C026	C		10	6-9.99	1.45
27	M30704C027	C		10	6-9.99	0.33
28	M30704C028	C		10	6-9.99	0.12
29	M30704C029	C		10	6-9.99	0.06
30	M30704C030	C		10	6-9.99	0.31
31	M30704C031	C		10	6-9.99	0.80
32	M30704C032	C		10	6-9.99	0.32
33	M30704C033	C		10	6-9.99	0.30
34	M30704C034	C		9, 10	6-9.99	1.35
35	M30704C035	C		10	6-9.99	1.07
36	M30704C036	C		10	6-9.99	0.29
37	M30704C037	C		10	6-9.99	0.28
38	M30704C038	C		9, 10	6-9.99	1.00
39	M30704C039	C		10	6-9.99	0.19
40	M30704C040	C		8	6-9.99	0.76
41	M30704C041	C		8	6-9.99	0.83
42	M30704C042	C		8	6-9.99	1.05
43	M30704C043	C		8	6-9.99	0.56
44	M30704C044	C		8	6-9.99	0.66
45	M30704C045	C		8	6-9.99	0.14
46	M30704C046	C		8	6-9.99	0.69
47	M30704C047	C		8	6-9.99	0.07
48	M30704C048	C		8	6-9.99	1.83
49	M30704C049	C		8	6-9.99	0.62
50	M30704C050	C		8	6-9.99	0.03

SN	Municipal Code	Class	Road Name	Wards Passed	ROW (in m)	Length (in km)
51	M30704C051	C		8	6-9.99	0.24
52	M30704C052	C		8	6-9.99	0.40
53	M30704C053	C		8, 9	6-9.99	3.21
54	M30704C054	C		8	6-9.99	3.05
55	M30704C055	C		7, 8, 9	6-9.99	8.79
56	M30704C056	C		7, 8	6-9.99	2.37
57	M30704C057	C		4, 7	6-9.99	4.58
58	M30704C058	C		7	6-9.99	2.77
59	M30704C059	C		7	6-9.99	1.34
60	M30704C060	C		7	6-9.99	1.19
61	M30704C061	C		5, 7	6-9.99	2.67
62	M30704C062	C		7	6-9.99	0.15
63	M30704C063	C		7	6-9.99	1.39
64	M30704C064	C		6, 7	6-9.99	1.77
65	M30704C065	C		8	6-9.99	1.14
66	M30704C066	C		8	6-9.99	0.13
67	M30704C067	C		8	6-9.99	0.11
68	M30704C068	C		8	6-9.99	3.49
69	M30704C069	C		8	6-9.99	1.68
70	M30704C070	C		8	6-9.99	0.15
71	M30704C071	C		8	6-9.99	0.41
72	M30704C072	C		6	6-9.99	1.00
73	M30704C073	C		6, 8	6-9.99	0.36
74	M30704C074	C		6, 8	6-9.99	1.28
75	M30704C075	C		6, 8	6-9.99	0.28

SN	Municipal Code	Class	Road Name	Wards Passed	ROW (in m)	Length (in km)
76	M30704C076	C		6, 8	6-9.99	0.44
77	M30704C077	C		8	6-9.99	0.31
78	M30704C078	C		6	6-9.99	0.18
79	M30704C079	C		6	6-9.99	0.38
80	M30704C080	C		5, 6	6-9.99	1.15
81	M30704C081	C		5	6-9.99	0.11
82	M30704C082	C		5, 6	6-9.99	0.16
83	M30704C083	C		5	6-9.99	1.04
84	M30704C084	C		5, 6	6-9.99	1.14
85	M30704C085	C		5, 6	6-9.99	1.04
86	M30704C086	C		9, 10	6-9.99	0.38
87	M30704C087	C		9	6-9.99	1.73
88	M30704C088	C		9	6-9.99	4.05
89	M30704C089	C		9	6-9.99	1.19
90	M30704C090	C		8	6-9.99	1.23
91	M30704C091	C		7	6-9.99	0.24
92	M30704C092	C		7	6-9.99	0.48
93	M30704C093	C		7, 8	6-9.99	5.14
94	M30704C094	C		7	6-9.99	0.86
95	M30704C095	C		8	6-9.99	1.20
96	M30704C096	C		8	6-9.99	0.20
97	M30704C097	C		8	6-9.99	0.14
98	M30704C098	C		8	6-9.99	0.10
99	M30704C099	C		8	6-9.99	0.07
100	M30704C100	C		1, 4	6-9.99	3.39

SN	Municipal Code	Class	Road Name	Wards Passed	ROW (in m)	Length (in km)
101	M30704C101	C		1, 4	6-9.99	0.77
102	M30704C102	C		4	6-9.99	0.42
103	M30704C103	C		4	6-9.99	0.13
104	M30704C104	C		1	6-9.99	1.14
105	M30704C105	C		1	6-9.99	1.07
106	M30704C106	C		1, 4	6-9.99	1.58
107	M30704C107	C		1, 4	6-9.99	3.02
108	M30704C108	C		4	6-9.99	1.28
109	M30704C109	C		4	6-9.99	0.70
110	M30704C110	C		4, 7	6-9.99	1.62
111	M30704C111	C		4, 7	6-9.99	0.63
112	M30704C112	C		4, 7	6-9.99	2.80
113	M30704C113	C		5, 7	6-9.99	1.22
114	M30704C114	C		5, 7	6-9.99	0.78
115	M30704C115	C		5, 7	6-9.99	0.45
116	M30704C116	C		7	6-9.99	0.13
117	M30704C117	C		5	6-9.99	0.79
118	M30704C118	C		5	6-9.99	0.17
119	M30704C119	C		5	6-9.99	0.43
120	M30704C120	C		5	6-9.99	0.56
121	M30704C121	C		5	6-9.99	0.23
122	M30704C122	C		5	6-9.99	0.11
123	M30704C123	C		6	6-9.99	0.18
124	M30704C124	C		6	6-9.99	0.18
125	M30704C125	C		6	6-9.99	0.02

SN	Municipal Code	Class	Road Name	Wards Passed	ROW (in m)	Length (in km)
126	M30704C126	C		6	6-9.99	0.11
127	M30704C127	C		6	6-9.99	0.15
128	M30704C128	C		6	6-9.99	0.06
129	M30704C129	C		6	6-9.99	0.73
130	M30704C130	C		6	6-9.99	0.17
131	M30704C131	C		6	6-9.99	0.15
132	M30704C132	C		6	6-9.99	0.07
133	M30704C133	C		6	6-9.99	0.22
134	M30704C134	C		6	6-9.99	0.22
135	M30704C135	C		6	6-9.99	0.18
136	M30704C136	C		6	6-9.99	0.46
137	M30704C137	C		6	6-9.99	0.08
138	M30704C138	C		6	6-9.99	0.07
139	M30704C139	C		6	6-9.99	0.08
140	M30704C140	C		6	6-9.99	0.06
141	M30704C141	C		6	6-9.99	0.12
142	M30704C142	C		6	6-9.99	0.23
143	M30704C143	C		6	6-9.99	0.52
144	M30704C144	C		5, 6	6-9.99	0.31
145	M30704C145	C		5	6-9.99	0.45
146	M30704C146	C		5	6-9.99	0.10
147	M30704C147	C		5	6-9.99	0.08
148	M30704C148	C		5	6-9.99	0.04
149	M30704C149	C		5	6-9.99	0.10
150	M30704C150	C		5	6-9.99	0.22

SN	Municipal Code	Class	Road Name	Wards Passed	ROW (in m)	Length (in km)
151	M30704C151	C		6	6-9.99	0.09
152	M30704C152	C		5	6-9.99	0.49
153	M30704C153	C		4, 5	6-9.99	0.32
154	M30704C154	C		4	6-9.99	0.87
155	M30704C155	C		4, 5	6-9.99	0.10
156	M30704C156	C		4	6-9.99	0.06
157	M30704C157	C		4	6-9.99	0.69
158	M30704C158	C		4	6-9.99	0.22
159	M30704C159	C		3, 4	6-9.99	1.58
160	M30704C160	C		3, 4	6-9.99	2.37
161	M30704C161	C		3, 4	6-9.99	0.83
162	M30704C162	C		4	6-9.99	0.43
163	M30704C163	C		4	6-9.99	0.10
164	M30704C164	C		4	6-9.99	0.48
165	M30704C165	C		4	6-9.99	0.45
166	M30704C166	C		4	6-9.99	0.20
167	M30704C167	C		4	6-9.99	0.30
168	M30704C168	C		4	6-9.99	0.07
169	M30704C169	C		4	6-9.99	0.37
170	M30704C170	C		3, 4	6-9.99	0.28
171	M30704C171	C		3, 4	6-9.99	0.12
172	M30704C172	C		3, 4	6-9.99	3.26
173	M30704C173	C		3, 4	6-9.99	0.21
174	M30704C174	C		3	6-9.99	0.33
175	M30704C175	C		2	6-9.99	1.19

SN	Municipal Code	Class	Road Name	Wards Passed	ROW (in m)	Length (in km)
176	M30704C176	C		2	6-9.99	0.70
177	M30704C177	C		2	6-9.99	0.23
178	M30704C178	C		2	6-9.99	0.96
179	M30704C179	C		3	6-9.99	0.49
180	M30704C180	C		2, 3	6-9.99	0.56
181	M30704C181	C		3	6-9.99	0.19
182	M30704C182	C		2	6-9.99	0.11
183	M30704C183	C		2	6-9.99	0.74
184	M30704C184	C		2	6-9.99	0.52
185	M30704C185	C		2	6-9.99	0.13
186	M30704C186	C		2	6-9.99	0.20
187	M30704C187	C		2	6-9.99	0.17
188	M30704C188	C		2, 3	6-9.99	0.15
189	M30704C189	C		2	6-9.99	0.14
190	M30704C190	C		3	6-9.99	0.26
191	M30704C191	C		2	6-9.99	0.13
192	M30704C192	C		2	6-9.99	0.18
193	M30704C193	C		2	6-9.99	0.15
194	M30704C194	C		2	6-9.99	0.26
195	M30704C195	C		2	6-9.99	0.06
196	M30704C196	C		2	6-9.99	0.25
197	M30704C197	C		1, 2	6-9.99	0.07
198	M30704C198	C		1, 4	6-9.99	0.13
199	M30704C199	C		1	6-9.99	0.07
200	M30704C200	C		1	6-9.99	0.11

SN	Municipal Code	Class	Road Name	Wards Passed	ROW (in m)	Length (in km)
201	M30704C201	C		1	6-9.99	0.13
202	M30704C202	C		4	6-9.99	2.57
203	M30704C203	C		1	6-9.99	0.32
204	M30704C204	C		1	6-9.99	0.28
205	M30704C205	C		1	6-9.99	0.25
206	M30704C206	C		1	6-9.99	0.17
207	M30704C207	C		1	6-9.99	0.52
208	M30704C208	C		1	6-9.99	0.07
209	M30704C209	C		1	6-9.99	0.07
210	M30704C210	C		1, 4	6-9.99	0.68
211	M30704C211	C		4	6-9.99	0.13
212	M30704C212	C		3	6-9.99	0.48
213	M30704C213	C		3	6-9.99	0.48
214	M30704C214	C		3	6-9.99	0.32
215	M30704C215	C		3	6-9.99	0.44
216	M30704C216	C		3	6-9.99	0.40
217	M30704C217	C		3	6-9.99	0.15
218	M30704C218	C		3	6-9.99	0.33
219	M30704C219	C		3	6-9.99	0.08
220	M30704C220	C		3	6-9.99	0.30
221	M30704C221	C		3	6-9.99	0.13
222	M30704C222	C		3	6-9.99	0.26
223	M30704C223	C		3	6-9.99	0.07
224	M30704C224	C		3	6-9.99	0.16
225	M30704C225	C		3	6-9.99	0.16

SN	Municipal Code	Class	Road Name	Wards Passed	ROW (in m)	Length (in km)
226	M30704C226	C		3	6-9.99	0.15
227	M30704C227	C		3	6-9.99	0.14
228	M30704C228	C		3	6-9.99	0.07
229	M30704C229	C		3	6-9.99	0.40
230	M30704C230	C		3	6-9.99	0.11
231	M30704C231	C		3	6-9.99	0.16
232	M30704C232	C		5	6-9.99	0.15
233	M30704C233	C		5	6-9.99	0.08
234	M30704C234	C		5	6-9.99	0.17
235	M30704C235	C		5	6-9.99	0.04
236	M30704C236	C		5	6-9.99	0.05
237	M30704C237	C		7	6-9.99	0.55
238	M30704C238	C		8	6-9.99	0.03
239	M30704C239	C		7, 8	6-9.99	0.86
240	M30704C240	C		4	6-9.99	0.37
241	M30704C241	C		4	6-9.99	0.35
242	M30704C242	C		2	6-9.99	0.05
243	M30704C243	C		2	6-9.99	0.06
244	M30704C244	C		4	6-9.99	0.05
245	M30704C245	C		8	6-9.99	0.10
246	M30704C246	C		8	6-9.99	0.16
247	M30704C247	C		8	6-9.99	0.14
248	M30704C248	C		8	6-9.99	0.31
249	M30704C249	C		8	6-9.99	0.06
250	M30704C250	C		1	6-9.99	0.25

SN	Municipal Code	Class	Road Name	Wards Passed	ROW (in m)	Length (in km)
251	M30704C251	C		5	6-9.99	0.14
252	M30704C253	C		7	6-9.99	0.43
253	M30704C254	C		4	6-9.99	0.08
254	M30704C255	C		3	6-9.99	0.09
255	M30704C256	C		7	6-9.99	0.08
256	M30704C257	C		9	6-9.99	0.03
257	M30704C258	C		4	6-9.99	0.44
258	M30704C259	C		2	6-9.99	0.09
259	M30704C260	C		2	6-9.99	1.11
260	M30704C261	C		4	6-9.99	0.19
261	M30704C262	C		2	6-9.99	0.04
262	M30704C263	C		2	6-9.99	0.19
263	M30704C264	C		10	6-9.99	0.13
264	M30704C265	C		3	6-9.99	0.11
265	M30704C266	C		4	6-9.99	0.26
266	M30704C267	C		4	6-9.99	0.84
267	M30704C268	C		10	6-9.99	0.04
268	M30704C271	C		1, 4	6-9.99	0.34
269	M30704C272	C		1, 4	6-9.99	1.17
270	M30704C273	C		1	6-9.99	0.68
271	M30704C274	C		1	6-9.99	0.42
272	M30704C275	C		1	6-9.99	0.06
273	M30704C277	C		1	6-9.99	0.01
274	M30704C278	C		1	6-9.99	0.09
275	M30704C279	C		1	6-9.99	0.51

SN	Municipal Code	Class	Road Name	Wards Passed	ROW (in m)	Length (in km)
276	M30704C280	C		1	6-9.99	0.11
277	M30704C281	C		1	6-9.99	0.03
278	M30704C282	C		1, 2	6-9.99	0.18
279	M30704C283	C		1, 2	6-9.99	0.09
280	M30704C284	C		1, 2	6-9.99	0.22
281	M30704C285	C		1, 3	6-9.99	0.54
282	M30704C286	C		1, 3	6-9.99	0.45
283	M30704C287	C		1, 3	6-9.99	0.13
284	M30704C288	C		1, 4	6-9.99	0.11
285	M30704C289	C		1, 4	6-9.99	0.15
286	M30704C290	C		1, 4, 5	6-9.99	1.24
287	M30704C291	C		1	6-9.99	0.12
288	M30704C292	C		1	6-9.99	0.03
289	M30704C293	C		1	6-9.99	0.04
290	M30704C294	C		1	6-9.99	0.01

4.6 ROAD INTERVENTIONS

Strategic Roads and District Roads are excluded for determining the cost of interventions, as the road standard and per unit cost of it also quite different than local level roads. The cost for the construction has determined based on these interventions. The final cost of interventions will be prepared after the preparation of complete prioritized rank list of roads and will be presented in final report. For the reference of the Municipality the categories of the interventions are defined below.

4.6.1 Conservation

Conservation refers to the actions required to repair a road and keep it in good and passable condition. Conservation activities include:

1. **Emergency maintenance** - Basic repairs aimed at removing landslides and repairing damage to the road that inhibit the proper use of the road and make it impassable. This mainly takes place during and after the rainy season. A provisional lump sum is

reserved for the entire district road core network based on the network length. Allocation to specific road sections is based on the actual need for clearing landslides or repairing washouts and cuts in the road.

2. **Routine maintenance** - General maintenance of the road aimed at preventing damage by ensuring the proper working of the different road elements (retaining walls, drainage system, carriageway, etc.) and cutting vegetation. This is carried out each year on a more or less continuous basis. Routine maintenance is required for the entire district road core network. The specific requirements for routine maintenance are determined on an annual basis through the road condition survey and defined in the Annual Road Maintenance Plan (ARMP).

3. **Recurrent maintenance** - Repairs of minor damage to the road surface and road structures to bring them back to good condition. This is generally carried out once or twice a year. Recurrent maintenance is required for the entire district road core network, whereby distinction is made according to the surface type. The specific requirements for recurrent maintenance are determined on an annual basis through the road condition survey and defined in the ARMP.

4. **Periodic maintenance** - Larger repairs to the road largely aimed at renewing the road surface through re-gravelling, resealing or overlays. It is generally carried out with several years interval. Although periodic maintenance is only required for specific sections of the district road core network, a lump sum allocation is made for the entire district road core network based on average annual requirements, distinguishing between different surface types. The specific periodic maintenance requirements are determined on an annual basis through the annual road condition survey and defined in the ARMP.

4.6.2 Improvement

Improvement refers to actions required to improve a road to bring it to a maintainable all weather standard. It includes the following actions, which are described briefly as following:

1. **Rehabilitation -** Significant repairs required to bring a very poor road back to a maintainable standard. This does not include any changes to the original surface type.

2. **Gravelling -** Placement of a gravel layer to make it all-weather and ensure that the road remains passable during the rainy season.

3. **Cross drainage structures**- Placement of suitable cross-drainage structures with the aim of making the road all-weather and ensuring that the road remains passable even during the rainy season

4. **Protective structures** - Placement of retaining walls and lined side drains to avoid excessive damage to the road during the rainy season and bring it to a maintainable standard.

5. **Blacktopping -** Placement of a blacktop layer in roads with traffic volumes exceeding 50 passenger car units (PCU) to reduce damage to the road surface.

6. **Widening -** Increase of the road width in roads with traffic volumes exceeding 500 passenger car units (PCU) to ensure the proper flow of traffic.

4.6.3 New Construction

New construction refers to construction of new road linkage according to the necessity of the Municipality especially in those places where roads have not linked. This includes opening of new track and establishment connectivity to the new area.

SECTION 5 MUNICIPAL TRANSPORT MASTER PLAN (MTMP)

5.1 Financial institutions

Road is a basic infrastructure that drives the economy of any area or region. It is public space and is shared by different road users. Therefore, it is the responsibility of the government to provide the necessary road infrastructure for the uninterrupted and smooth movement of goods and people for higher economic activities. But the government alone cannot fund the investments as road investments are huge. Therefore, it is necessary to explore other possible financial institutions and funding agencies who can invest in the road infrastructure.

Capital investment plan is essential to support local government in developing good and best practice in construction, upgrading, overall asset management and especially operation and maintenance of the road projects. The most common sources of funding which are investing in the road sectors in Suryabinayak Municipality and other cities in Nepal are listed and summarized below:

- Users' participation
- Municipality office's internal revenue
- State/central government
- Regional line agencies
- Donor agencies, NGO, INGO, etc.
- Town Development Fund (TDF)
- Department of Urban Development and Building Construction (DUDBC)

In recent days, the involvement of the **local users** (end beneficiaries) of the road projects and interventions have been the driving factor for the construction and maintenance of the road infrastructure. Their involvement helps to create informed, responsible and accountable citizens in the community. It also generates a sense of ownership and thus promote preservation and proper use of the infrastructure and the facilities. Such involvement is essential to construct and maintain the local roads if not higher hierarchy roads. People's participation can be ensured through different methods – direct investment, free labor, maintenance, tree plantation, cleanliness, etc.

Municipality Office has the major role in developing the overall infrastructure within the municipal boundary. It is the local government responsible of preparing the necessary framework and implementing policies and strategies for the planned and sustainable development of the necessary infrastructures and facilities. As road infrastructure supports other infrastructure and facilities, the role of municipality in the development and maintenance of the road infrastructure is further pronounced. A major share of the municipal budget is generated from the revenue collected from taxes and service charge, and should be allocated to provide infrastructure and service such as maintenance of the roads and

construction of wider roads to meet the planned class and ROW. The annual program should address the local need and the need of emergency and specific maintenance. Specific roads should be constructed as a whole and not in parts for longer period of time.

Under the new federal structure of the nation, the **federal or state government** may also contribute to the development of the major urban roads. The involvement and contribution of the local level government is certainly required and will support the development of transport sector throughout the nation.

Other **institutions and line agencies** working in the field of development of local and regional roads also play important role in the development of the municipal roads. Normally, these institutions investin the roads that are important in a regional context, rather than local small area context.sss

Town Development Fund (TDF) and **Urban Development and Building Office (UDBO)** are governmental funding agencies which contributes to the development of emerging town and cities. They can be a major source of fund for major urban road projects in Suryabinayak Municipality.

Like the line agencies, there are many donors funded projects run by NGOs and INGOs in the sector ofroad and other infrastructure development. The development of wider roads of higher hierarchy required greater amount of investment and, technical and administrative capacity which may be lacking with the local body and institutions. Such projects are implemented through donor funded projects. KVDA (KVRIP) are examples of such projects. They can be important sources of investment for major roads of the municipality.

5.2 FIVE YEAR PROJECTED FINANCIAL PLAN

The previous year budget of the Municipality was collected and the growth rated was then determined. Then short term and long term financial plan shall be forecasted. The Projected financial plan for five year is be prepared. The current budget plan of the Rural Municipality has presented in table below. Based on the growth pattern, the growth factor is determined and the budget for coming year has forecasted as shown in below. The composition of source of budget in Municipality shows heterogeneous in nature. The very high amount of budget is granted by the ministry. Therefore, if there is any changes occurred in granted amount by government, there result will be significant change in the Municipality budget. The growth rate that has been used in all the calculations is 10%, as it is used for general purpose when we don't have precise growth rate.

5.3 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). The budget plan is based on realistic approach and takes consideration of annual allocated budget of municipality. The first year expenditure is made to equal to that approved by Municipal Committee (Nagar Parisad). Then the expenditure of every following year is increased by 20%, i.e. second year road expenditure is 20% extra of first year expenditure. Similarly, the third year expenditure is increased by 20% of second year expenditure. If there occurs budget deficit, then the expenditure of road needs to be based on the provided priority.

MTMP mainly deals with Class A, B and C roads, and it may found that Class D roads are not given any consideration. Intervention on those roads needs 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 occurs deficit in annual expenditure, municipality needs to incorporate that particular heading in next year at any cost. They can look for grant, assistance from district or even central level or they can incorporate them by shifting budget from less importance item/heading.

The road wise allocation of budget for each year has been calculated after development of scoring criteria. The first year expenditure is determined approximately NRs 27,662,624.33. Then the expenditure has been increased by 20% yearly. From this calculation the approximate total budget for the twenty years for the roads of all class is NRs. 5,164,280,000.00. It is recommended that the municipality follows the planned investment as envisaged in the MTMP and this will ensure efficient use of available resources and proper development of the municipality.

5.4 Staging implementation plan

The proposed work plan are implemented in stage by stage basis as discussed in the underlying section.

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.

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 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 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.

Determining Scoring Criteria

Prioritization of roads and infrastructure is necessary as provision of all demanded infrastructure cannot be constructed at a time due to time, labor and financial constraints. Scoring criteria specific to the local development phase should be developed and revised periodically. Scoring criteria developed during the phase where roads are prioritized for basic accessibility cannot be used to prioritize roads where accessibility has been provided to most of the population. As development proceeds, the priority criteria of people changes (from accessibility to mobility). Scoring criteria and the interventions' plan should be revised accordingly, at least during Mid Period Review.

Mid period review

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, amid 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 survey, 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.

Scoring Criteria and 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 and various intervention 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 can be used for prioritization includes existing population within the zone of influence, present road demand, future potential route, accessibility situation, land use pattern, environmental and social safeguard, proximity to the market/service centers, religious and tourism places. These criteria are given various weightage and weightage average of all the criteria is summed up to come with a priority of intervention. All type of intervention are provided with same scoring criteria. The finalized scoring criteria 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 fulfilment of the particular criteria. The weighted average of score that each intervention receives leads to a ranking/prioritization of the intervention options. The criteria for prioritization discussed in Table 5 were used as prioritization indicator

Based on the prioritization criteria, the roads have been prioritized. The investment should follow the prioritization list as given below.

Table 10 Rank of each of the proposed road class A, B and C

Road Code	Ward Pass	Priority Score	Rank	Rank in Class
M30704A001	2, 3, 4, 5	79.86	1	1
M30704A002	7	63.43	25	2
M30704B001	8	65.07	19	11
M30704B002	8	72.98	7	5
M30704B003	6, 7, 8, 9	77.22	4	2
M30704B004	8	67.08	15	9
M30704B005	8, 9	67.89	13	8
M30704B006	9	66.48	16	10
M30704B007	10	62.92	28	13
M30704B008	10	61.15	37	14
M30704B009	2	74.76	5	3
M30704B010	2	71.46	9	6
M30704B011	2, 3, 4	77.94	2	1

Road Code	Ward Pass	Priority Score	Rank	Rank in Class
M30704B012	4	73.75	6	4
M30704B013	4	64.74	21	12
M30704B014	1, 4	69.68	12	7
M30704C001	9	54.07	205	119
M30704C002	8, 9, 10	57.89	108	60
M30704C003	10	50.65	636	158
M30704C004	9, 10	51.48	481	150
M30704C005	10	61.14	38	22
M30704C006	10	57.65	122	65
M30704C007	10	50.46	656	160
M30704C008	10	49.59	791	171
M30704C009	10	63.89	22	9
M30704C010	7, 10	56.83	137	78
M30704C011	10	51.33	517	152
M30704C012	10	53.15	314	131
M30704C013	10	56.71	143	82
M30704C014	10	50.31	678	162
M30704C015	10	58.22	104	56
M30704C016	10	50.65	636	158
M30704C017	10	49.96	769	167
M30704C018	10	60.66	39	23
M30704C019	10	53.15	314	131
M30704C020	10	49.62	788	170
M30704C021	10	48.65	1140	177
M30704C022	10	50.65	636	158
M30704C023	10	50.65	636	158
M30704C024	10	50.65	636	158
M30704C025	10	54.38	203	117
M30704C026	10	53.15	314	131
M30704C027	10	49.78	782	168
M30704C028	10	50.65	636	158
M30704C029	10	50.65	636	158
M30704C030	10	49.96	769	167
M30704C031	10	50.87	598	155
M30704C032	10	50.65	636	158
M30704C033	10	50.65	636	158
M30704C034	9, 10	58.24	103	55
M30704C035	10	51.76	449	146
M30704C036	10	50.65	636	158
M30704C037	10	46.94	1602	184
M30704C038	9, 10	57.98	106	58
M30704C039	10	50.65	636	158

Road Code	Ward Pass	Priority Score	Rank	Rank in Class
M30704C040	8	52.43	347	140
M30704C041	8	49.76	783	169
M30704C042	8	50.74	612	157
M30704C043	8	49.76	783	169
M30704C044	8	51.39	484	151
M30704C045	8	51.76	450	147
M30704C046	8	51.67	459	149
M30704C047	8	49.08	1037	175
M30704C048	8	52.26	352	143
M30704C049	8	51.08	590	154
M30704C050	8	51.76	450	147
M30704C051	8	49.08	1037	175
M30704C052	8	51.76	450	147
M30704C053	8, 9	53.65	219	123
M30704C054	8	58.73	79	44
M30704C055	7, 8, 9	58.43	86	50
M30704C056	7, 8	52.89	324	136
M30704C057	4, 7	61.91	34	19
M30704C058	7	55.05	178	105
M30704C059	7	59.73	57	33
M30704C060	7	59.42	67	36
M30704C061	5, 7	56.08	148	86
M30704C062	7	52.31	351	142
M30704C063	7	53.00	321	133
M30704C064	6, 7	59.23	68	37
M30704C065	8	48.33	1165	179
M30704C066	8	47.08	1595	183
M30704C067	8	51.08	590	154
M30704C068	8	51.72	456	148
M30704C069	8	49.54	792	172
M30704C070	8	51.08	590	154
M30704C071	8	47.76	1319	181
M30704C072	6	70.73	11	4
M30704C073	6, 8	55.02	179	106
M30704C074	6, 8	63.11	27	13
M30704C075	6, 8	52.63	329	137
M30704C076	6, 8	52.99	322	134
M30704C077	8	47.76	1319	181
M30704C078	6	56.87	136	77
M30704C079	6	56.76	138	79
M30704C080	5, 6	60.56	43	26
M30704C081	5	55.09	170	103

Road Code	Ward Pass	Priority Score	Rank	Rank in Class
M30704C082	5, 6	54.48	190	112
M30704C083	5	59.05	71	40
M30704C084	5, 6	62.91	29	14
M30704C085	5, 6	65.69	17	6
M30704C086	9, 10	51.48	481	150
M30704C087	9	55.74	152	90
M30704C088	9	57.91	107	59
M30704C089	9	50.04	692	165
M30704C090	8	49.15	1036	174
M30704C091	7	48.90	1042	176
M30704C092	7	51.98	437	144
M30704C093	7, 8	58.49	84	48
M30704C094	7	52.58	333	139
M30704C095	8	48.50	1141	178
M30704C096	8	51.76	450	147
M30704C097	8	51.76	450	147
M30704C098	8	51.76	450	147
M30704C099	8	47.76	1319	181
M30704C100	1, 4	63.56	23	10
M30704C101	1, 4	56.76	139	80
M30704C102	4	59.09	70	39
M30704C103	4	55.09	171	104
M30704C104	1	56.67	144	83
M30704C105	1	63.28	26	12
M30704C106	1, 4	60.07	53	30
M30704C107	1, 4	71.92	8	2
M30704C108	4	56.47	145	84
M30704C109	4	55.09	171	104
M30704C110	4, 7	55.26	166	100
M30704C111	4, 7	52.61	332	138
M30704C112	4, 7	61.39	36	21
M30704C113	5, 7	55.84	150	88
M30704C114	5, 7	53.27	225	127
M30704C115	5, 7	54.84	183	108
M30704C116	7	51.89	444	145
M30704C117	5	55.65	160	94
M30704C118	5	54.41	193	114
M30704C119	5	56.91	134	75
M30704C120	5	52.91	323	135
M30704C121	5	50.00	767	166
M30704C122	5	51.09	586	153
M30704C123	6	53.87	212	121

Road Code	Ward Pass	Priority Score	Rank	Rank in Class
M30704C124	6	55.19	167	101
M30704C125	6	57.19	128	71
M30704C126	6	53.19	229	129
M30704C127	6	53.87	212	121
M30704C128	6	57.19	128	71
M30704C129	6	60.59	42	25
M30704C130	6	53.87	212	121
M30704C131	6	55.87	149	87
M30704C132	6	57.31	126	69
M30704C133	6	55.69	154	92
M30704C134	6	56.37	146	85
M30704C135	6	53.58	220	124
M30704C136	6	57.07	132	73
M30704C137	6	53.19	229	129
M30704C138	6	57.19	128	71
M30704C139	6	53.19	229	129
M30704C140	6	53.87	212	121
M30704C141	6	55.19	167	101
M30704C142	6	55.69	154	93
M30704C143	6	60.37	44	27
M30704C144	5, 6	55.69	153	91
M30704C145	5	57.20	127	70
M30704C146	5	50.07	690	164
M30704C147	5	54.41	193	115
M30704C148	5	54.66	186	110
M30704C149	5	50.00	767	166
M30704C150	5	54.55	188	111
M30704C151	6	53.19	229	129
M30704C152	5	58.36	101	53
M30704C153	4, 5	54.41	193	115
M30704C154	4	53.49	221	125
M30704C155	4, 5	58.41	100	52
M30704C156	4	55.09	171	104
M30704C157	4	58.66	82	46
M30704C158	4	54.41	193	115
M30704C159	3, 4	65.40	18	7
M30704C160	3, 4	71.00	10	3
M30704C161	3, 4	55.16	169	102
M30704C162	4	53.15	313	130
M30704C163	4	51.09	586	153
M30704C164	4	53.09	317	132
M30704C165	4	51.09	586	153

Road Code	Ward Pass	Priority Score	Rank	Rank in Class
M30704C166	4	55.09	171	104
M30704C167	4	53.09	317	132
M30704C168	4	55.09	171	104
M30704C169	4	51.09	586	153
M30704C170	3, 4	54.48	190	112
M30704C171	3, 4	55.80	151	89
M30704C172	3, 4	77.82	3	1
M30704C173	3, 4	58.48	85	49
M30704C174	3	61.92	33	18
M30704C175	2	63.51	24	11
M30704C176	2	57.76	120	63
M30704C177	2	55.54	162	96
M30704C178	2	62.54	30	15
M30704C179	3	61.64	35	20
M30704C180	2, 3	62.32	31	16
M30704C181	3	57.87	109	61
M30704C182	2	59.54	59	35
M30704C183	2	67.40	14	5
M30704C184	2	62.04	32	17
M30704C185	2	59.54	59	35
M30704C186	2	55.52	163	97
M30704C187	2	54.85	181	107
M30704C188	2, 3	58.70	81	45
M30704C189	2	59.54	59	35
M30704C190	3	60.37	44	27
M30704C191	2	59.54	59	35
M30704C192	2	59.54	59	35
M30704C193	2	59.54	59	35
M30704C194	2	56.90	135	76
M30704C195	2	59.54	59	35
M30704C196	2	59.54	59	35
M30704C197	1, 2	58.30	102	54
M30704C198	1, 4	56.76	140	81
M30704C199	1	58.42	87	51
M30704C200	1	53.27	226	128
M30704C201	1	53.27	226	128
M30704C202	4	55.59	161	95
M30704C203	1	54.39	201	116
M30704C204	1	53.74	216	122
M30704C205	1	54.42	192	113
M30704C206	1	58.42	87	51
M30704C207	1	59.88	55	31

Road Code	Ward Pass	Priority Score	Rank	Rank in Class
M30704C208	1	58.42	87	51
M30704C209	1	58.42	87	51
M30704C210	1, 4	55.27	165	99
M30704C211	4	53.93	211	120
M30704C212	3	64.91	20	8
M30704C213	3	60.37	44	27
M30704C214	3	60.37	44	27
M30704C215	3	59.69	58	34
M30704C216	3	60.37	44	27
M30704C217	3	57.87	109	61
M30704C218	3	60.14	51	28
M30704C219	3	57.87	109	61
M30704C220	3	60.37	44	27
M30704C221	3	57.59	123	66
M30704C222	3	60.37	44	27
M30704C223	3	57.87	109	61
M30704C224	3	57.87	109	61
M30704C225	3	53.19	229	129
M30704C226	3	57.87	109	61
M30704C227	3	57.87	109	61
M30704C228	3	57.87	109	61
M30704C229	3	56.37	146	85
M30704C230	3	57.87	109	61
M30704C231	3	57.87	109	61
M30704C232	5	54.75	184	109
M30704C233	5	54.41	193	115
M30704C234	5	55.09	171	104
M30704C235	5	55.09	171	104
M30704C236	5	54.41	193	115
M30704C237	7	47.78	1316	180
M30704C238	8	50.29	679	163
M30704C239	7, 8	50.59	648	159
M30704C240	4	53.09	317	132
M30704C241	4	53.46	222	126
M30704C242	2	58.85	76	43
M30704C243	2	57.54	124	67
M30704C244	4	54.41	193	115
M30704C245	8	59.12	69	38
M30704C246	8	47.76	1319	181
M30704C247	8	51.08	590	154
M30704C248	8	51.08	590	154
M30704C249	8	51.08	590	154

Road Code	Ward Pass	Priority Score	Rank	Rank in Class
M30704C250	1	58.42	87	51
M30704C251	5	54.41	193	115
M30704C253	7	49.29	1017	173
M30704C254	4	50.75	611	156
M30704C255	3	57.12	131	72
M30704C256	7	49.29	1017	173
M30704C257	9	47.29	1591	182
M30704C258	4	53.09	317	132
M30704C259	2	54.85	181	107
M30704C260	2	59.85	56	32
M30704C261	4	50.41	657	161
M30704C262	2	58.85	76	43
M30704C263	2	58.85	76	43
M30704C264	10	49.96	769	167
M30704C265	3	57.42	125	68
M30704C266	4	52.41	348	141
M30704C267	4	55.33	164	98
M30704C268	10	50.65	636	158
M30704C271	1, 4	54.08	204	118
M30704C272	1, 4	58.92	75	42
M30704C273	1	60.11	52	29
M30704C274	1	57.74	121	64
M30704C275	1	57.81	119	62
M30704C277	1	58.42	87	51
M30704C278	1	58.42	87	51
M30704C279	1	57.03	133	74
M30704C280	1	58.42	87	51
M30704C281	1	58.42	87	51
M30704C282	1, 2	58.98	72	41
M30704C283	1, 2	58.98	72	41
M30704C284	1, 2	58.98	72	41
M30704C285	1, 3	60.65	40	24
M30704C286	1, 3	60.65	40	24
M30704C287	1, 3	58.15	105	57
M30704C288	1, 4	56.76	140	81
M30704C289	1, 4	56.76	140	81
M30704C290	1, 4, 5	58.63	83	47
M30704C291	1	58.42	87	51
M30704C292	1	58.42	87	51
M30704C293	1	58.42	87	51
M30704C294	1	58.42	87	51

The detailed distribution of budget for all the planned roads of class A, B and C for a total of 20 years is given in the table below:

Table 11 Budget and ROW for each of the proposed road class A, B and C

Rank	Code	Total Cost (in Rs.)	Cost per km per 2 lanes	Class	Length (in km)	ROW (in m)
1	M30704A001	384,330,000.00	45,796,435.49	A	3.92	>14
2	M30704B011	35,630,000.00	5,154,014.97	B	2.42	10-14
3	M30704C172	27,120,000.00	5,819,448.13	C	3.26	6-9.99
4	M30704B003	329,680,000.00	15,458,924.88	B	10.66	10-14
5	M30704B009	191,830,000.00	183,419,833.78	B	0.52	10-14
6	M30704B012	208,040,000.00	52,669,181.14	B	1.97	10-14
7	M30704B002	197,320,000.00	48,609,725.39	B	2.03	10-14
8	M30704C107	10,860,000.00	2,513,872.26	C	3.02	6-9.99
9	M30704B010	11,490,000.00	10,172,876.93	B	0.56	10-14
10	M30704C160	18,170,000.00	5,370,042.77	C	2.37	6-9.99
11	M30704C072	7,710,000.00	5,392,427.22	C	1.00	6-9.99
12	M30704B014	18,150,000.00	4,391,253.69	B	2.07	10-14
13	M30704B005	25,670,000.00	2,928,740.45	B	4.38	10-14
14	M30704C183	5,660,000.00	5,388,775.24	C	0.74	6-9.99
15	M30704B004	109,180,000.00	20,378,520.09	B	2.68	10-14
16	M30704B006	16,630,000.00	2,789,664.65	B	2.98	10-14
17	M30704C085	4,520,000.00	3,027,762.79	C	1.04	6-9.99
18	M30704C159	138,590,000.00	61,400,671.77	C	1.58	6-9.99
19	M30704B001	254,830,000.00	58,920,040.49	B	2.16	10-14
20	M30704C212	3,710,000.00	5,395,321.01	C	0.48	6-9.99

Rank	Code	Total Cost (in Rs.)	Cost per km per 2 lanes	Class	Length (in km)	ROW (in m)
21	M30704B013	20,940,000.00	15,210,550.63	B	0.69	10-14
22	M30704C009	3,440,000.00	2,508,045.95	C	0.96	6-9.99
23	M30704C100	12,740,000.00	2,631,760.67	C	3.39	6-9.99
24	M30704C175	142,050,000.00	83,354,150.56	C	1.19	6-9.99
25	M30704A002	5,890,000.00	2,776,175.79	A	0.99	>14
26	M30704C105	4,280,000.00	2,805,984.35	C	1.07	6-9.99
27	M30704C074	7,360,000.00	4,014,521.47	C	1.28	6-9.99
28	M30704B007	66,060,000.00	15,485,987.13	B	2.13	10-14
29	M30704C084	22,210,000.00	13,597,713.39	C	1.14	6-9.99
30	M30704C178	7,420,000.00	5,394,659.76	C	0.96	6-9.99
31	M30704C180	3,530,000.00	4,430,228.83	C	0.56	6-9.99
32	M30704C184	1,850,000.00	2,514,465.46	C	0.52	6-9.99
33	M30704C174	1,200,000.00	2,508,750.76	C	0.33	6-9.99
34	M30704C057	27,350,000.00	4,184,151.63	C	4.58	6-9.99
35	M30704C179	1,850,000.00	2,643,509.93	C	0.49	6-9.99
36	M30704C112	151,410,000.00	37,856,569.58	C	2.80	6-9.99
37	M30704B008	6,270,000.00	2,791,467.99	B	1.12	10-14
38	M30704C005	14,620,000.00	4,503,893.93	C	2.27	6-9.99
39	M30704C018	7,870,000.00	2,809,344.01	C	1.96	6-9.99
40	M30704C285	1,950,000.00	2,515,674.59	C	0.54	6-9.99
42	M30704C129	19,670,000.00	18,795,345.19	C	0.73	6-9.99
43	M30704C080	22,790,000.00	13,861,133.22	C	1.15	6-9.99
44	M30704C143	1,880,000.00	2,511,575.00	C	0.52	6-9.99

Rank	Code	Total Cost (in Rs.)	Cost per km per 2 lanes	Class	Length (in km)	ROW (in m)
51	M30704C218	1,190,000.00	2,499,392.40	C	0.33	6-9.99
52	M30704C273	2,860,000.00	2,928,369.05	C	0.68	6-9.99
53	M30704C106	6,390,000.00	2,836,016.97	C	1.58	6-9.99
55	M30704C207	2,040,000.00	2,752,622.51	C	0.52	6-9.99
56	M30704C260	8,510,000.00	5,389,199.35	C	1.11	6-9.99
57	M30704C059	16,760,000.00	8,760,656.80	C	1.34	6-9.99
58	M30704C215	1,590,000.00	2,523,649.29	C	0.44	6-9.99
59	M30704C182	420,000.00	2,562,627.48	C	0.11	6-9.99
67	M30704C060	9,170,000.00	5,397,065.62	C	1.19	6-9.99
68	M30704C064	6,350,000.00	2,512,950.60	C	1.77	6-9.99
69	M30704C245	760,000.00	5,447,470.82	C	0.10	6-9.99
70	M30704C102	1,510,000.00	2,515,983.76	C	0.42	6-9.99
71	M30704C083	3,720,000.00	2,513,008.97	C	1.04	6-9.99
72	M30704C282	650,000.00	2,517,915.94	C	0.18	6-9.99
75	M30704C272	9,010,000.00	5,393,507.10	C	1.17	6-9.99
76	M30704C242	190,000.00	2,543,847.90	C	0.05	6-9.99
79	M30704C054	28,970,000.00	6,640,572.43	C	3.05	6-9.99
81	M30704C188	550,000.00	2,513,054.83	C	0.15	6-9.99
82	M30704C157	136,550,000.00	139,014,933.36	C	0.69	6-9.99
83	M30704C290	12,300,000.00	6,969,357.49	C	1.24	6-9.99
84	M30704C093	39,430,000.00	5,366,094.36	C	5.14	6-9.99
85	M30704C173	740,000.00	2,510,882.10	C	0.21	6-9.99
86	M30704C055	141,630,000.00	11,281,864.77	C	8.79	6-9.99

Rank	Code	Total Cost (in Rs.)	Cost per km per 2 lanes	Class	Length (in km)	ROW (in m)
87	M30704C199	250,000.00	2,528,682.48	C	0.07	6-9.99
100	M30704C155	133,230,000.00	906,308,915.28	C	0.10	6-9.99
101	M30704C152	1,770,000.00	2,515,572.59	C	0.49	6-9.99
102	M30704C197	250,000.00	2,495,009.98	C	0.07	6-9.99
103	M30704C034	276,140,000.00	142,894,421.89	C	1.35	6-9.99
104	M30704C015	17,640,000.00	3,711,971.68	C	3.33	6-9.99
105	M30704C287	460,000.00	2,501,223.42	C	0.13	6-9.99
106	M30704C038	3,580,000.00	2,515,574.28	C	1.00	6-9.99
107	M30704C088	14,630,000.00	2,528,276.16	C	4.05	6-9.99
108	M30704C002	143,710,000.00	56,238,588.43	C	1.79	6-9.99
109	M30704C181	690,000.00	2,514,236.93	C	0.19	6-9.99
119	M30704C275	230,000.00	2,486,025.76	C	0.06	6-9.99
120	M30704C176	5,370,000.00	5,391,728.67	C	0.70	6-9.99
121	M30704C274	1,500,000.00	2,508,954.58	C	0.42	6-9.99
122	M30704C006	161,110,000.00	74,366,682.73	C	1.52	6-9.99
123	M30704C221	460,000.00	2,480,166.37	C	0.13	6-9.99
124	M30704C243	1,880,000.00	21,038,832.31	C	0.06	6-9.99
125	M30704C265	400,000.00	2,484,604.33	C	0.11	6-9.99
126	M30704C132	710,000.00	7,643,801.91	C	0.07	6-9.99
127	M30704C145	1,610,000.00	2,516,782.27	C	0.45	6-9.99
128	M30704C125	80,000.00	2,618,168.22	C	0.02	6-9.99
131	M30704C255	310,000.00	2,547,127.73	C	0.09	6-9.99
132	M30704C136	10,650,000.00	16,179,754.80	C	0.46	6-9.99

Rank	Code	Total Cost (in Rs.)	Cost per km per 2 lanes	Class	Length (in km)	ROW (in m)
133	M30704C279	3,890,000.00	5,310,010.63	C	0.51	6-9.99
134	M30704C119	1,530,000.00	2,515,986.26	C	0.43	6-9.99
135	M30704C194	2,000,000.00	5,386,811.55	C	0.26	6-9.99
136	M30704C078	1,370,000.00	5,384,857.26	C	0.18	6-9.99
137	M30704C010	6,490,000.00	2,515,147.35	C	1.81	6-9.99
138	M30704C079	5,520,000.00	10,070,918.66	C	0.38	6-9.99
139	M30704C101	2,780,000.00	2,514,929.97	C	0.77	6-9.99
143	M30704C013	9,650,000.00	2,842,796.91	C	2.38	6-9.99
144	M30704C104	8,320,000.00	5,098,498.90	C	1.14	6-9.99
145	M30704C108	5,470,000.00	2,990,749.69	C	1.28	6-9.99
146	M30704C134	1,680,000.00	5,396,500.53	C	0.22	6-9.99
148	M30704C061	10,520,000.00	2,760,988.18	C	2.67	6-9.99
149	M30704C131	4,590,000.00	21,027,074.08	C	0.15	6-9.99
150	M30704C113	4,390,000.00	2,513,814.53	C	1.22	6-9.99
151	M30704C171	430,000.00	2,502,931.17	C	0.12	6-9.99
152	M30704C087	7,680,000.00	3,112,725.12	C	1.73	6-9.99
153	M30704C144	7,160,000.00	16,250,145.90	C	0.31	6-9.99
154	M30704C133	1,680,000.00	5,398,507.15	C	0.22	6-9.99
160	M30704C117	3,940,000.00	3,470,011.70	C	0.79	6-9.99
161	M30704C202	77,030,000.00	21,001,551.33	C	2.57	6-9.99
162	M30704C177	1,780,000.00	5,385,267.02	C	0.23	6-9.99
163	M30704C186	1,430,000.00	4,998,501.95	C	0.20	6-9.99
164	M30704C267	6,740,000.00	5,602,912.85	C	0.84	6-9.99

Rank	Code	Total Cost (in Rs.)	Cost per km per 2 lanes	Class	Length (in km)	ROW (in m)
165	M30704C210	15,580,000.00	15,952,280.65	C	0.68	6-9.99
166	M30704C110	145,240,000.00	62,642,561.30	C	1.62	6-9.99
167	M30704C124	5,440,000.00	21,007,105.34	C	0.18	6-9.99
169	M30704C161	24,870,000.00	21,005,878.61	C	0.83	6-9.99
170	M30704C081	820,000.00	5,386,282.81	C	0.11	6-9.99
176	M30704C234	630,000.00	2,531,413.06	C	0.17	6-9.99
178	M30704C058	10,150,000.00	2,566,566.36	C	2.77	6-9.99
179	M30704C073	9,520,000.00	18,706,542.52	C	0.36	6-9.99
181	M30704C187	1,270,000.00	5,384,941.55	C	0.17	6-9.99
183	M30704C115	1,620,000.00	2,510,771.52	C	0.45	6-9.99
184	M30704C232	560,000.00	2,534,805.07	C	0.15	6-9.99
186	M30704C148	140,000.00	2,432,667.25	C	0.04	6-9.99
188	M30704C150	790,000.00	2,503,361.20	C	0.22	6-9.99
190	M30704C082	1,200,000.00	5,407,562.86	C	0.16	6-9.99
192	M30704C205	1,950,000.00	5,408,660.99	C	0.25	6-9.99
193	M30704C118	600,000.00	2,519,012.55	C	0.17	6-9.99
201	M30704C203	2,310,000.00	5,022,238.23	C	0.32	6-9.99
203	M30704C025	2,980,000.00	2,514,416.31	C	0.83	6-9.99
204	M30704C271	10,060,000.00	21,005,658.58	C	0.34	6-9.99
205	M30704C001	12,780,000.00	3,382,492.78	C	2.64	6-9.99
211	M30704C211	4,010,000.00	20,983,150.69	C	0.13	6-9.99
212	M30704C123	1,400,000.00	5,377,229.08	C	0.18	6-9.99
216	M30704C204	2,180,000.00	5,415,899.18	C	0.28	6-9.99

Rank	Code	Total Cost (in Rs.)	Cost per km per 2 lanes	Class	Length (in km)	ROW (in m)
219	M30704C053	70,440,000.00	15,364,313.52	C	3.21	6-9.99
220	M30704C135	1,400,000.00	5,365,717.45	C	0.18	6-9.99
221	M30704C154	21,560,000.00	17,358,559.14	C	0.87	6-9.99
222	M30704C241	4,320,000.00	8,520,133.89	C	0.35	6-9.99
225	M30704C114	11,630,000.00	10,417,026.55	C	0.78	6-9.99
226	M30704C200	850,000.00	5,393,841.05	C	0.11	6-9.99
229	M30704C126	830,000.00	5,348,233.52	C	0.11	6-9.99
313	M30704C162	2,190,000.00	3,601,872.13	C	0.43	6-9.99
314	M30704C012	3,840,000.00	2,511,478.24	C	1.07	6-9.99
317	M30704C164	14,480,000.00	21,001,334.34	C	0.48	6-9.99
321	M30704C063	8,970,000.00	4,507,333.84	C	1.39	6-9.99
322	M30704C076	3,360,000.00	5,388,501.32	C	0.44	6-9.99
323	M30704C120	4,310,000.00	5,395,352.16	C	0.56	6-9.99
324	M30704C056	8,520,000.00	2,512,604.10	C	2.37	6-9.99
329	M30704C075	2,120,000.00	5,392,265.51	C	0.28	6-9.99
332	M30704C111	146,990,000.00	163,389,912.33	C	0.63	6-9.99
333	M30704C094	3,090,000.00	2,511,089.78	C	0.86	6-9.99
347	M30704C040	2,750,000.00	2,517,969.14	C	0.76	6-9.99
348	M30704C266	7,860,000.00	20,993,830.06	C	0.26	6-9.99
351	M30704C062	540,000.00	2,481,047.55	C	0.15	6-9.99
352	M30704C048	54,980,000.00	21,000,408.70	C	1.83	6-9.99
437	M30704C092	1,920,000.00	2,778,036.15	C	0.48	6-9.99
444	M30704C116	460,000.00	2,535,413.11	C	0.13	6-9.99

Rank	Code	Total Cost (in Rs.)	Cost per km per 2 lanes	Class	Length (in km)	ROW (in m)
449	M30704C035	8,920,000.00	5,834,777.86	C	1.07	6-9.99
450	M30704C045	510,000.00	2,521,702.89	C	0.14	6-9.99
456	M30704C068	31,970,000.00	6,404,983.63	C	3.49	6-9.99
459	M30704C046	2,490,000.00	2,516,662.24	C	0.69	6-9.99
481	M30704C004	1,390,000.00	2,506,846.81	C	0.39	6-9.99
484	M30704C044	2,390,000.00	2,516,065.67	C	0.66	6-9.99
517	M30704C011	1,610,000.00	2,523,635.29	C	0.45	6-9.99
586	M30704C163	800,000.00	5,427,671.43	C	0.10	6-9.99
589	M30704C122	830,000.00	5,383,417.96	C	0.11	6-9.99
590	M30704C049	2,230,000.00	2,514,161.28	C	0.62	6-9.99
598	M30704C031	141,130,000.00	122,756,507.43	C	0.80	6-9.99
611	M30704C254	600,000.00	5,342,152.12	C	0.08	6-9.99
612	M30704C042	5,450,000.00	3,623,955.92	C	1.05	6-9.99
636	M30704C003	1,870,000.00	2,525,642.31	C	0.52	6-9.99
648	M30704C239	3,100,000.00	2,508,827.14	C	0.86	6-9.99
656	M30704C007	30,810,000.00	21,002,679.02	C	1.03	6-9.99
657	M30704C261	1,490,000.00	5,411,322.79	C	0.19	6-9.99
678	M30704C014	2,240,000.00	2,517,488.36	C	0.62	6-9.99
679	M30704C238	360,000.00	9,384,426.32	C	0.03	6-9.99
690	M30704C146	750,000.00	5,408,133.83	C	0.10	6-9.99
692	M30704C089	8,830,000.00	5,200,690.62	C	1.19	6-9.99
767	M30704C121	1,760,000.00	5,403,200.69	C	0.23	6-9.99
769	M30704C017	1,340,000.00	2,509,302.88	C	0.37	6-9.99

Rank	Code	Total Cost (in Rs.)	Cost per km per 2 lanes	Class	Length (in km)	ROW (in m)
782	M30704C027	3,480,000.00	7,343,365.65	C	0.33	6-9.99
783	M30704C041	24,780,000.00	20,998,652.63	C	0.83	6-9.99
788	M30704C020	5,800,000.00	7,352,701.48	C	0.55	6-9.99
791	M30704C008	11,750,000.00	6,797,436.40	C	1.21	6-9.99
792	M30704C069	46,160,000.00	19,282,894.96	C	1.68	6-9.99
1017	M30704C253	12,930,000.00	21,002,923.84	C	0.43	6-9.99
1036	M30704C090	28,690,000.00	16,267,281.40	C	1.23	6-9.99
1037	M30704C047	2,090,000.00	21,034,621.58	C	0.07	6-9.99
1042	M30704C091	850,000.00	2,530,859.47	C	0.24	6-9.99
1140	M30704C021	9,050,000.00	20,995,313.75	C	0.30	6-9.99
1141	M30704C095	157,090,000.00	91,609,495.60	C	1.20	6-9.99
1165	M30704C065	23,760,000.00	14,611,005.69	C	1.14	6-9.99
1316	M30704C237	4,150,000.00	5,283,854.87	C	0.55	6-9.99
1319	M30704C071	3,160,000.00	5,398,703.53	C	0.41	6-9.99
1591	M30704C257	210,000.00	5,384,812.63	C	0.03	6-9.99
1595	M30704C066	960,000.00	5,373,205.93	C	0.13	6-9.99
1602	M30704C037	5,220,000.00	13,037,939.91	C	0.28	6-9.99

Among the above-mentioned roads, the intervention for the roads from the above table shall be implemented for the first five years, as shown in the table below:

Table 12 Distribution of budget for the first five years

Rank	Code	Length to be Considered	Year 1			Year 2			Year 3			Year 4			Year 5		
			Length (km)	Amount	Budget Cumulative	Length (km)	Amount	Budget Cumulative	Length (km)	Amount	Budget Cumulative	Length (km)	Amount	Budget Cumulative	Length (km)	Amount	Budget Cumulative
1	M30704A001	1.57	0.50	22898217.7	22898217.7	0.50	22898217.7	22898217.7	0.50	22898217.75	22898217.75	0.07	3046946.76	3046946.76			
2	M30704B011	0.73	0.50	2577007.5	25475225.2	0.23	1164142.5	24062360.3									
3	M30704C172	0.65	0.38	2187399.1	27662624.3	0.28	1609400.9	25671761.2									
4	M30704B003	3.20				0.49	7523388.0	33195149.2	0.50	7729462.4	30627680.2	0.50	7729462.4	10776409.2	0.50	7729462.4	7729462.4
5	M30704B009	0.16							0.05	9206498.8	39834179.0	0.11	19568001.2	30344410.4			
6	M30704B012	0.59										0.33	17456604.5	47801014.8	0.09	4871409.4	12600871.9
7	M30704B002	0.61													0.11	5293137.3	17894009.2
8	M30704C107	0.60													0.10	263463.9	18157473.0
12	M30704B014	0.62													0.12	526873.2	18684346.2
13	M30704B005	1.31													0.50	1464370.2	20148716.4
15	M30704B004	0.80													0.30	6187740.0	26336456.4
16	M30704B006	0.89													0.39	1099667.7	27436124.0
19	M30704B001	0.65													0.15	8764479.8	36200603.8
23	M30704C100	0.68													0.18	467719.7	36668323.5
28	M30704B007	0.64													0.14	2166006.4	38834329.9
34	M30704C057	0.92													0.42	1736924.2	40571254.1
36	M30704C112	0.56													0.06	2269115.2	42840369.3
79	M30704C054	0.61													0.11	735513.8	43575883.1
84	M30704C093	1.03													0.50	2683047.2	46258930.3
86	M30704C055	1.76													0.50	5640932.4	51899862.7
104	M30704C015	0.67													0.17	613614.2	52513476.8
107	M30704C088	0.81													0.31	784061.9	53297538.7
148	M30704C061	0.53													0.03	92305.9	53389844.6
161	M30704C202	0.51													0.01	283424.3	53673269.0
178	M30704C058	0.55													0.05	137716.8	53810985.8

Rank	Code	Length to be Considered	Year 1			Year 2			Year 3			Year 4			Year 5		
			Length (km)	Amount	Budget Cumulative	Length (km)	Amount	Budget Cumulative	Length (km)	Amount	Budget Cumulative	Length (km)	Amount	Budget Cumulative	Length (km)	Amount	Budget Cumulative
205	M30704C001	0.53													0.03	97953.6	53908939.4
219	M30704C053	0.64													0.14	2179443.2	56088382.6
456	M30704C068	0.70													0.20	1272835.2	57361217.8

SECTION 6 CONCLUDING REMARK (WAY FORWARD)

The country has recently undergone restructuring and the way of planning and implementing development activities has changed as compared to the past practices, giving more power and budgetto the local levels. The new formed local levels are required to provide maximum input for implementation of the prepared plans and support the development of the municipality and its infrastructures.

The study included a series surveys for data collection, series of different level interaction with the locals and various authorities. The study has identified all the roads of the municipality, their status and interventions required. The map of MIM, MTPP and other maps are prepared. Detail implementation strategy and other significant plans have been prepared. The inventory shows that majority of roads are narrow and needs upgrading and maintenance. 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 municipality. Introduction of proper city 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 municipality area. The report presents the necessary functions of the roads and their characteristics. 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. As the implementation strategy suggests, the municipality needs to develop proper framework and policies for the implementation of the perspective plans, built the capacity of the municipality and the local organizations and committees and proper stages of development of the roads.

The institutional capacity of the Municipality needs to be strengthened with technical experts such as urban planner, GIS experts and others to effectively understand and implement the plans prepared. To make the transport sector sustainable, a more rigorous study that prepares plans at local level forthe management of traffic at local level should be done. Further, the coordination among the stakeholders for different kind of development activities need to be strengthened to ensure effective implementation of such plans prepared