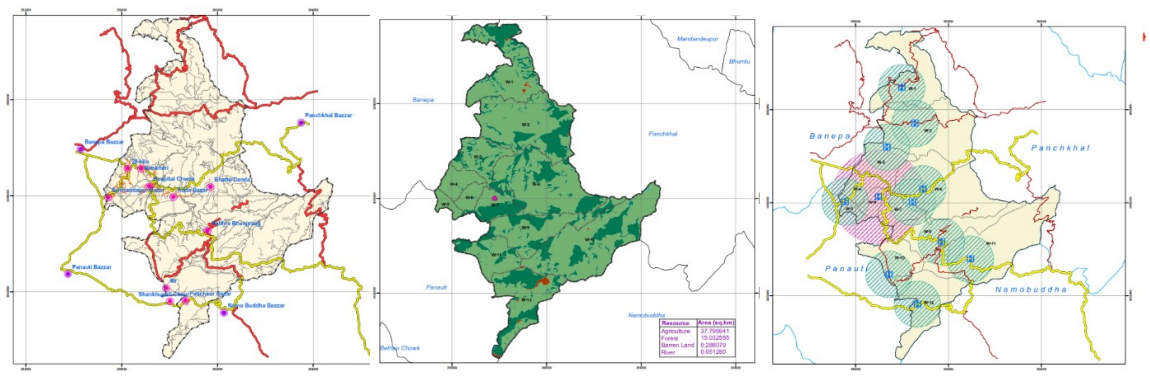
Government of Nepal

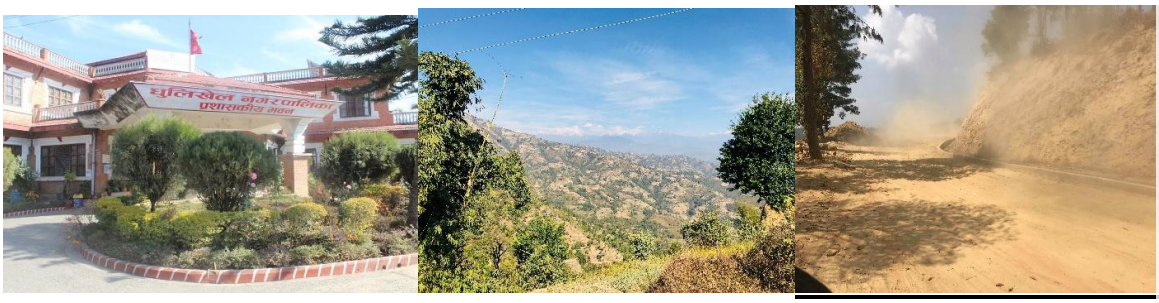
Dhulikhel Municipality

INTEGRATED URBAN DEVELOPMENT PLAN OF DHULIKHEL MUNICIPALITY

Volume 8: Municipal Transport Management Plan

2019





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EXECUTIVE SUMMARY

The Integrated Urban Development Plan (IUDP) for Dhulikhel is a strategic response to the 20-year growth of Dhulikhel Municipality, which brings together infrastructure provision, environmental management, economic growth, disaster preparedness, municipal service delivery and mainstreaming gender equality and social inclusion. This "whole of Council" strategic plan will deliver on the long-term vision of Municipality:

A prosperous, well governed and model town Dhulikhel

based on culture, heritage, tourism and environmentally friendly sustainable development.

Transportation is considered as the "Infrastructure for Infrastructure" and forms a basis for increasing the access as well as mobility in either rural as well as urban environment. Urbanization and its associated transportation infrastructure define the relationship between city and countryside, accessibility is one of the major components to improve access of the people to services and facilities through increased mobility. Increased mobility results in better linkages with activity centers, access to tourist destinations, areas of agricultural production to markets, and access to critical services including health, education, security and areas of employment. Accessibility is a critical factor in generating equal opportunities to live, work and visit Dhulikhel.

With the declaration of the expanded municipality, the Municipal Transport Master Plan (MTMP) is the first step towards the long-term perspective for the planned development of the transport networks in the Municipality. Thus, MTMP is being developed in Dhulikhel Municipality, along with other strategic plans prepared as part of the Integrated Urban Development Plan (IUDP) to support investment in the development of a systematic transport system with appropriate guidelines, prioritization criteria and standards to facilitate transparent decision-making for the investment of this critical infrastructure.

Critically, MTMP must be read in conjunction with the over Development Plans as presented in the IUDP. It is one piece of the puzzle. The IUDP, presented in 16 volumes, also covers institutional and technical issues. The report provides comprehensive details on: urban management, institutional development; physical development planning, social development planning, economy, environment, institutional and financial planning along with social

impacts and poverty; gender and social inclusion; and the subproject resettlement plans and disaster risk reduction. Based on the immediate needs of the municipality, short term plans and long-term plans have been developed which will support Dhulikhel's growth.

The Municipality Road Coordination Committee (MRCC) has been constituted as authorized legislative body of municipality, which has been prepared using participatory bottom-up approach. The Municipality Road Coordination Committee (MRCC), comprising all political parties' representatives and concerned technical officials has been constituted as authorized legislative body of municipality for MTMP preparation and implementation process.

Dhulikhel Municipality, located within the Kavrepalanchowk district, comprises an area of 54.62 square kilometres. The latest census (2011) counted a population of 32,162 living in 7,061 households. The population density of the municipality averages 1,017 people per squarekilometre however there are areas which are sparsely populated and other highly urbanized areas with much higher density. Household surveys were conducted to understand socio-economic and trip characteristics within the municipality. A demand survey of various interventions was carried out to understand the actual need intervention based on priority order. A Road Inventory survey, with help of manual and GPS methods was undertaken to summarize the actual road scenario within the municipality.

The land use distribution of Dhulikhel municipality shows that about 55% of the area is covered by cultivable land and just 2.75% of the area is built up at present. Forest covers around 39% and water bodies' covers around 0.5% of the total area. Due to significant cultivable land, this municipality has a greater role to play in agricultural sector. Also, the vision to make the city a "Tourist Hub" is also another highlight of the city with many opportunities for trekking, increased accommodation and ago-based homestays.

Almost 346.1 kilometres of road exists within the municipality, including two Strategic Roads, two Feeder Roads and six District Roads. Long route public transportation is available along the Araniko Highway and BP Highway from 5.00am to Kathmandu and other various places. Famous local buses include Sajha Yatayat, Mayur Yatayat etc. The bus transportation provides very good connectivity between Dhulikhel and Kathmandu, however the flow of public transportation within the municipality is very weak.

Within the Municipality, walking is the most dominate mode of transport. Due to the lack of footpaths and proper vehicular infrastructure, pedestrians are forced to share their path with vehicles. Most of the roads are narrow and poorly maintained and need to be upgraded. Survey work revealed that most of the roads are earthen and people demand the upgrading of the present road network for betterment of their ward.

Traffic congestion is increasing in the bazar areas and no speed limits exist within the local roads. The road width is not adequate even in context of SRN roads. Lack of traffic signs, signals and speed controls have been identified. Similarly, the construction of new roads and upgrading of present roads need to be based on interaction of local people and participation of local community is must for the effectiveness of the intervention.

The MTMP proposes a series of road categories to be applied – Categories A-B-C-D. A Road Hierarchy had been developed and, using the classification the Muncipality comprises two Class A Roads, nine Class B Roads, 84 Class C Roads and 165 Class D Roads. Design standards set a minimum right-of-way width of 16, 12, 9 and 7 metres for Class A, B, C and D roads respectively. The roads have been prioritized based on eight criteria and the first five-year financial plan is prepared based on the assumption that the second-year budget will increase 10% from first year budget.

The present municipal budget needs to be increased to cater for the demand of the infrastructure of the municipality. The total estimated budget of approximately 9 crores (2075/76) seems satisfactory and though the large proportion of municipal budget need to be expenditure on road and transport infrastructure. All roads and intervention is assumed to be completed on 20-year time period and on this basis yearly budget is calculated. Each year budget is increased at 10%. The road budget is allocated in proportion of 70% - 30% for construction and maintenance. And even the construction budget is allocated in ratio of 10%-35%-45%-10% for Class A, B, C and D roads respectively. The final cost allocation for MTMP period is as follows:

Year	Cost of various Intervention (In Lakhs)							
	Class A	**Class B**	**Class C**	**Class D**	**Mainte nance**	**Total**	**Probable Budget**	**Deficit**
1	64	224	288	70	276.85	922.85	641.00	281.85
2	70	247	317	68.2	301.00	1003.20	706.00	297.20
3	77	271	349	77	331.70	1105.70	776.70	329.00
4	85	299	384	85	365.57	1218.57	854.00	364.57
5	93	328	422	93.9	401.50	1338.40	839.80	498.60

Importantly, the approach for managing transport is very different in the built-up areas, compared with the rural areas.

In the bazar areas, density is much higher and as infill areas continue to develop, priority will be given to pedestrians and cyclists with vehicles having a secondary and less dominant role, and some areas will be pedestrian only. A series of Community parking areas on the edge of the town will accommodate vehicles. In new residential and commercial growth areas, a similar approach will be taken. Roads will be narrower, 'shared spaces', compatible with the dominant mode of transport, walking.

In the rural areas, and areas that provide links between settlements, wider roads will be developed in accordance with the road categories and specifications. These roads will be upgraded to facilitate public transport and freight vehicles, moving products from site to market. Finally, given the role of Dhulikhel Municipality as a tourist destination, the roads will be developed to accommodate cycling with Class B Roads providing specific infrastructure for this purpose and local Class C and D Roads allowing for a mix of users with a focus on pedestrians.

शारांस

भनिन्छ यातायात पूर्वधारहरुको पनि पूर्वधार हो जसले नगरपालिका क्षेत्रको शहरीरुप र आर्थिक समुन्नती निर्धारण गर्दछ र यो यस क्षेत्रको बातावरनिय, आर्थिक र सामाजिक दिगोपन को प्रमुख कारक पनि हो। नगर यातायत गुरुयोजना रणनैतिक योजनाको दस्ताबेज हो जसले नगरपालिकालाई आउने २० बर्ष र पछाडिका दिनहरुमा आवश्यक हुने यातायातका निती तथा कार्यक्रमहरु परिभाषित गर्दछ। बिकासको सम्भाब्यता बोकेको क्षेत्र तथा नगरपालिकाको दुर्गामी बिकास सोचलाई आधार बनाएर भविष्यमा हुनसक्ने भु-उपयोग परिवर्तनलाई मध्य नजर गरि तयार पारिएको यस योजनाले समग्र नगरपालिकाको बिकासलाई प्रतिबिम्बित गर्दछ।

१२ वडा सहित को धुलिखेल नगरपालिका काभ्रेपलान्चोक जिल्ला, बाग्मती अञ्चल अन्तर्गत पर्दछ र यसको क्षेत्रफल ५४.६२ बर्ग कि.मि. रहेको छ। यसको जनसंख्या ३२,१६२ रहेको छ भने जनघनत्व १०१७ प्रती बर्ग किमी रहेको छ। आर्थिक - सामाजिक अनी स्थानियहरुको यात्रा को बारेमा थाहा पाउन को लागि घरधुरी सर्बेक्षण गरिएको छ । प्रत्यक वडा को माग थाहा पाउन को लागि प्रत्यक वडा मा गई माग फारम भर्ने काम पनि गरिएको छ र जि पि एस् प्रबिधी बाट बाटोको वास्तविक डाटा लिने काम गरिएको छ । राजनीतिक पार्टी का प्रतिनिधि अनी प्राबिधिक अधिकारीहरु लाई समेटी नगर बाटो समन्वय समिती (MRCC)समेत तयार गरिएको छ।

नगरपालिका भित्र कारीब २९१.६४ कि.मि. बाटो रहेको जसमध्ये २ वटा रणनैतिक सडक, २ वटा फिडर सडक र ६ वटा जिल्ला सडक रहेकका छन् । धेरै जसो कच्ची रहेको पाइयो। बाटोमा पैदल् यात्री हरुलाई र बाटो सुरक्षा लाई कुनै महत्व दिएको पाइएन । १४.१ कि मि नया बाटो प्रस्ताव गरिएको छ । धेरै जसो सडकहरु साघुरो अनी अब्यवस्थित रहेको र उचित सम्रक्षण नभएको पाइयो। कतिपय वडा हरुमा सार्वजनिक यातायात को पहुच नभएको र भएकोमा पनि उचित यातायात सन्जाल नरहेको पाइयो। नयाँ ट्र्याक खोल्ने र अहिलेको लाई स्तरोन्नती गर्ने कुरामा पनि स्थानियहरु सँग समन्बय गरेर अगाडि बढीएको छ। धेरै जसो कृषि योग्य जमिन रहेकोले नगरपालिकाले कृषि क्षेत्रमा धेरै काम गर्नु पर्ने देखिन्छ । दिर्घकालिन सोचमा धुलिखेल नगरपालिकालाई TOURIST DESTINATION(पर्यटकीय गन्तब्य) को रुपमा बिकास गर्ने रहेको छ।

बाटोको तहगत सम्रचना बिकासगर्दा नगर सडक समन्बय समिती एवम सरोकारवालाहरु सँग छलफल गरी चार किसिमका सडकको तहगत सम्रचना गरिएको छ जसमध्ये **Class A सडक मा २ वटा, Class B मा ९ वटा, Class C मा ८४ वटा र Class D मा १६५** वटा बाटो प्रस्तावित गरिएको छ। बिभिन्न किसिमका बाटोहरुको लागि न्युनतम बाटोको क्षेत्राधिकार १६ मि, १२ मि, ९ मि र ७ मि तयगरिएको छ।

आठ वटा मापदन्ड तयगरी बाटोको प्राथमिकिकरण गरिएको छ। प्रत्यक बर्ष को बजेट १०% ले बृदि हुनेछ भन्ने मानिएको र प्रस्तावित सम्रचना हरु २० बर्षामा बनेर सकिने हिसाबले आगामी पाँच बर्ष को आर्थिक योजना तयारपारीएको छ। खर्च बजेट्मा निर्माण र स्तरोन्नतिको लागि ७०% छुत्याइएको छ भने ३०% मर्मत सम्भारका लागि छुटयाइएको छ। गुरुयोजना कार्यन्बयन प्रकृया चक्रिय हो र यसलाई सक्रिय सार्वजनिक सहभागिता को आवश्यकता पर्दछ। दुर्गामी बिकास योजनाले उध्योग, कृषि र ब्यापारलाई प्रमुख क्षेत्र मानेर प्रस्तुत गरेकोमा यस

गुरुयोजनाले सो योजनालाई समाबिस्ट गरी अनी २०७५/७६ को बजेट लाई आधार बनाएर बाटो को लागि निम्नानुसर को अन्तिम लागत तयार पारीएको छ।

Year	Cost of various Intervention (In Lakhs)							
	Class A	Class B	Class C	Class D	Mainte nance	Total	Probable Budget	Deficit
1	64	224	288	70	276.85	922.85	641	281.85
2	70	247	317	68.2	301	1003.2	706	297.2
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4	85	299	384	85	365.57	1218.57	854	364.57
5	93	328	422	93.9	401.5	1338.4	839.8	498.6

The IUDP consists of the following Volumes:

Volume 1	Background Report
Volume 2	Physical Development Plan
Volume 3	Land Use and Zoning Plan
Volume 4	Social Development Plan
Volume 5	Economic Development Plan
Volume 6	Environment Management Plan
Volume 7	Conservation, Culture and Tourism Plan
Volume 8	Municipal Transport Management Plan
Volume 9	Distaster Risk Reduction Plan
Volume 10	Consolidated Implementation Plan
Volume 11	Financial and Organisation Plan
Volume 12	By-Laws
Volume 13	Municipal profile
Volume 14	Feasibility Study – Waterfall Construction in Ward 1
Volume 15	Pre-Feasibility Study – Artificial Lake in Wards 7 and 8
Volume 16	Feasibility Study – Walking Trail in Wards 7 and 8

ACRONYMS/ABBREVIATIONS

DDC	District Development Committee
DTMP	District Transport Master Plan
GIS	Geographic Information System
IDPM	Indicative Development Potential Map
MIM	Municipality Road Inventory Map
MRCC	Municipality Road Coordination Committee
MTMP	Municipality Transport Master Plan
VDC	Village Development Committee
MTPP	Municipality Transport Perspective Plan
GPS	Global Positioning System
OD	Origin and Destination
ToR	Terms of Reference
HH	Household
VDCs	Village Development Committees
PT	Public Transport
Min.	Minute
Km.	Kilometre
Sq. km	Square Kilometre
Ha	Hectare

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CHAPTER 1: INTRODUCTION

1.1 Background

Alarming population growth and rapid urbanization has become the greatest noteworthy scenario in context of the national development. With the increased migration into the Kathmandu Valley, the provision of well-planned and well-managed infrastructure for urban development has become a challenge. New settlement patterns are emerging, with residential areas spatially separated from workplaces, major shopping concentrated in identifiable centers, and increased demand for entertainment and relaxation facilities are found at specific locations. In addition, there are now greater opportunities for movement of agricultural goods with emerging markets across the country and borders.

Transport facilities help to facilitate access, providing rural-urban linkages. Road accessibility can reduce isolation, stimulate agricultural production and marketing activities, encourage the use of public services and help transfer technology. Road infrastructure is considered as "the infrastructure for infrastructure" and road building has been seen to bring about notable enthusiasm and visible improvements to rural life. However, in the absence of notable criteria and rational guidelines, road construction is often carried out in a reactive manner, resulting in haphazard use and waste of limited resources.

Ministry of Federal Affairs and Local Development (MoFALD) created new municipalities from those urban and semi-urban settlements by combining prevalent Village Development Communities in 2073 B.S. Dhulikhel Municipality is one among them. To bring coherence and proper planning in infrastructure development of the urban areas, the Ministry directed these newly formed municipalities to prepare a series of plans for its well-planned development. The preparation of the Municipal Transport Management Plan, as part of the Integrated Urban Development Plan, is one of them.

After being designated as a municipal area, it will attract more population as socio-economic growth and other infrastructure development will gain pace. The Municipality and its surrounding VDCs will see a rapid increase in housing, infrastructure and urban services demand. In this regard, formulation of MTMP was initiated for assessing the present road and transport infrastructures and facilities within the Municipality and the surrounding VDCs. To

function as a proper Municipality or a city, it must have a very good mobility and accessibility by public and private means of transportation.

Dhulikhel Municipality is facing increased migrants from nearby surrounding areas and rapid urbanization for whole Kavrepalanchowk district. Such an increase in population also increases demand for physical infrastructure including housing, transport, waste management, water supply, electricity and so on. Dhulikhel Municipality is yet to define and implement a strategic urban development plan that guides land use, prioritises infrastructure and implements locationally specific building and planning bylaws. Without these tools, of the Municipality will experience serious urban environmental issues including insufficiency of transportation and its management, inadequate drinking water supply, uncontrolled and unmanageable urban and physical development resulting in urban sprawl within the Municipality and surrounding VDCs.

1.2 Objectives

The Municipality Transport Master Plan (MTMP/MTPP) for Dhulikhel Municipality has been developed using a participatory and bottom-up approach from the settlement level. It includes a constructive plan to incorporate all the transportation needs and facilities for now and tomorrow. The specific objectives of the MTMP are mentioned below:

1. Prepare the Municipality Road Inventory Map (MIM) of all road networks.
2. Identify the major road networks linking the Municipality with the surrounding areas.
3. Prepare Indicative Development Potential Map (IDPM).
4. Finalize visionary city development plan if Comprehensive Town Development Plan is not prepared.
5. Collection of demands for new/rehabilitation transport linkages from Municipalities/settlements based on city development plan.
6. Analyse the present mobility and accessibility situation.
7. Identify and prioritize the interventions based on mobility and accessibility situation.
8. Develop scoring criteria and its approval from Municipality.
9. Prepare the Perspective Plan of transport services and facilities (Municipal Transport Perspective Plan)
10. Prepare physical and financial implementation plan of prioritized roads for the MTMP period.
11. Prepare a five year Municipality Transport Master Plan (MTMP).

1.3 Scope of work

The scope of this work is summarized as:

a. Accessibility data collection and analysis:
   Carrying out various surveys to gain data on accessibility situation including travel patterns, questionnaire surveys and origin-destination survey.
b. Analyze mobility status of the Municipality including how efficiently; economically and safely goods and passengers are transported.
c. Assess the condition of public transportation, considering data on different public transportation routes and their operation characteristics, which operate within the municipal area and to other adjoining area.
d. Assess road safety status and issues including a review of roadside conditions during road inventory survey and other accident data. Possible interventions to make the roads safer are to be proposed and recommended.
e. Prepare the Physical Development Plan using topographical base maps and digitized GIS maps. In the Physical Development Plan, potential areas for development are to be identified and prioritized based on proximity to existing settlements, maximizing use of existing infrastructure and future land supply and demand requirements. These areas will be verified by the Municipality and Municipality Road Coordination Committee.
f. Prepare Municipality Inventory Map (MIM) of existing roads within Dhulikhel Municipality:
   MIP linking to strategic road networks and all other roads including district core road network, main trails and bridges is to be prepared. It has to include the road names, total length and breadth of the roads, surface type, existing condition, Right of way, vehicular traffic and pedestrian traffic flow etc.
g. Collection of demands for New/Upgrading/Rehabilitation transport linkages from Wards/Settlements:
   Data regarding the construction, maintenance or rehabilitation of roads according to the existing condition and demand is to be done. Such data has to be collected in priority order through ward meeting or community level discussion. The roadside condition of all the linkages should be noted during the road inventory survey.
h. Scoring criteria:

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

i. Road classification and Nomenclature:

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

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

All data are to be used to prepare a perspective plan of interventions of services and facilities. All the identified interventions should be screened and rated on the basis of approved criteria and forwarded to Municipality council meetings. The final perspective plan has to be shown in GIS maps.

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

Information on the resources required for construction/ rehabilitation is to be collected. Studies to project the resources to fund the transport infrastructures for next five years are to be done and discussing with Municipality is to be done to find out the appropriate proportion to be spent on ongoing roads and new interventions proposed.

l. Prepare Municipal Transport Master Plan (MTMP) of Dhulikhel Municipality:

MTMP is to be prepared with due consideration to existing and projected future situation. Base scenario of existing road and transport network based on O-D survey, projected transport infrastructure network and management plan is to be prepared.

m. Medium term and long-term planning:

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

1.4 Study Area

Dhulikhel Municipality lies in Kavrepalanchok District, Province No. 3 of Nepal. Located in Central Nepal; the geographical coordinates are 27° 36' 992 North, 85° 33' East and the altitude is 1505m. It is located at the Eastern rim of Kathmandu Valley, south of the Himalayas and is situated 30 km southeast of Kathmandu and 74 km southwest of Kodari.

The Muncipality was established in 2043 B.S. constituting 9 wards (Area=14.01 Sq. Km.) but with an expansion of area, the municipality now constitutes 12 wards with the total area of

54.62 Sq.km. It was restructured on Falgun, 2073 B.S. merging one existing municipality and five existing VDCs i.e. Dhulikhel, Raviopi, Devitar, Sarada Batase, Paatlekhet, and Sankhupati chaur. The Population Census 2011 of Nepal counted 32,162 persons in 7,061 households of Dhulikhel Municipality.

Two major highways, B.P. Highway, also known as Banepa Bardibas Highway, and the Araniko Highway, pass through Dhulikhel effectively dividing the municipality into three equal parts. Araniko Highway connects Kathmandu, Nepal's capital city, with Tibet's border town of Kodari. It has been an important trading centre on the commercial route linking Nepal to Tibet for centuries. BP Highway links Kathmandu Valley with the Eastern Terai Region. The convergence of the two major highways in Dhulikhel makes Dhulikhel a strategically important city.

Dhulikhel Municipality is bordered by Kavre V.D.C in the east, Panauti Municipality in south, Banepa and Pachkhal Municipality to the north and Banepa Municipality in the west.

Ward. No.	Included VDCs/Municipalities	Included Wards
1.	Devitar	1-3, 6-9
2.	Rabi gaun	1-5
3.	Dhulikhel	6
4.	Dhulikhel	7
5.	Dhulikhel	8,9
6.	Dhulikhel	4,5
7.	Dhulikhel	2,3
8.	Dhulikhel	1,13
9.	Dhulikhel	10-12
10.	Sharada Batase	1,2,5,6-8
11.	Patle khet	1-9
12.	Shankhu Patichaur	1-3,5-9

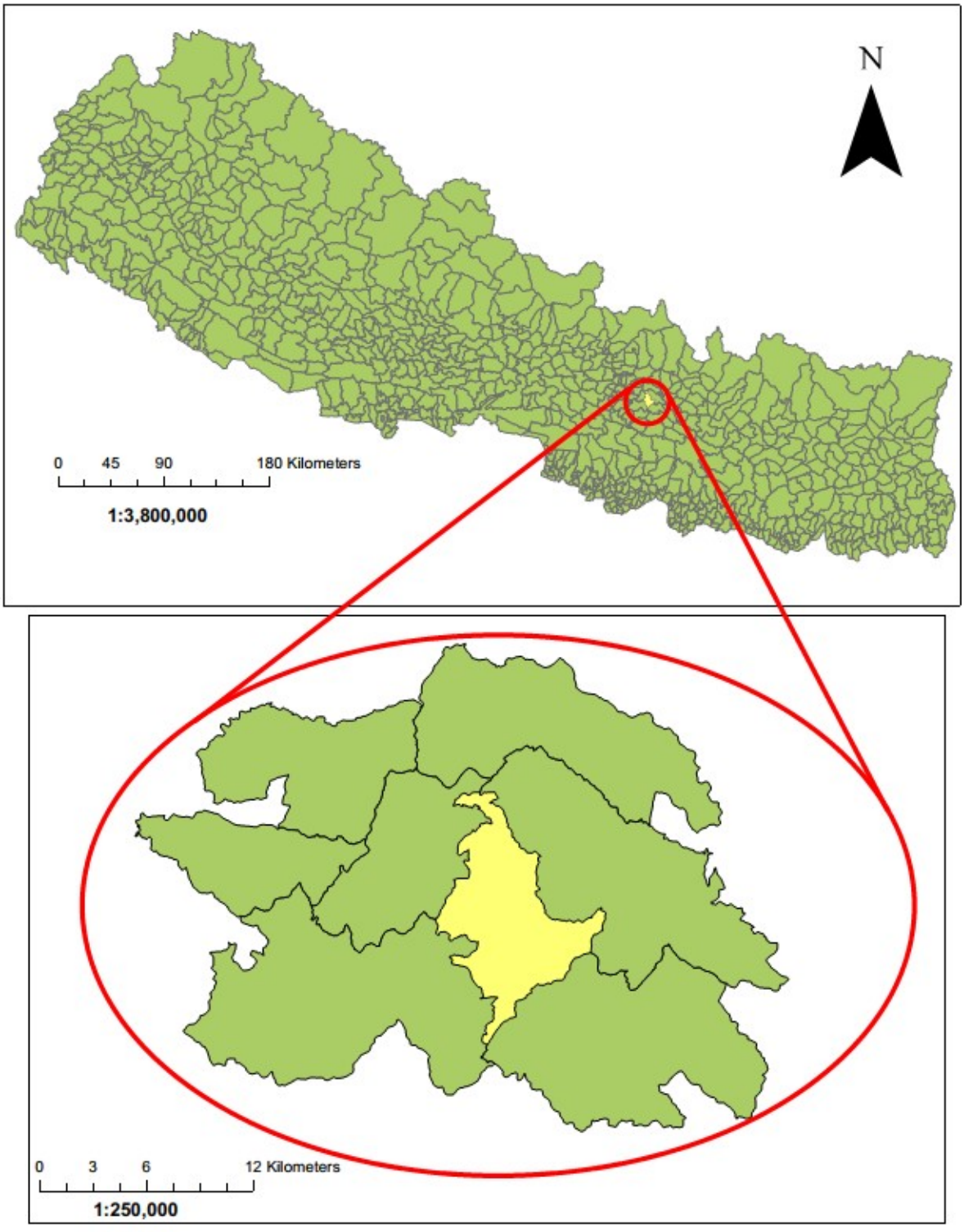


Figure 1: Location Map

1.5 Organization of Report

This report is presented in seven chapters. Chapter 1 deals with introduction, covering background, scope and objectives. Chapter 2 deals with Methodology, considering all types of surveys carried out during field. Chapter 3 deals with existing condition of study area. Chapter 4 describes potential factors of the Municipality and chapter 5 describes the proposed road hierarchy network. Chapter 6 deals with the prioritization criteria and chapter 7 provides the conclusion of the study and implementation recommendations.

CHAPTER 2: METHODOLOGY OF FIELD WORKS:

2.1 Approach

The Municipality Transport Master Plan (MTMP) is prepared using participatory bottom-up approach from the settlement level. Techno-Political interface is incorporated in the planning process, where active participation from representatives of political parties, line agencies, Municipality officials is crucial. The Municipality Road Coordination Committee (MRCC) is constituted as an authorized legislative body of Municipality.

2.2 Methodology

The study starts with desk study, via collection of secondary data. The study got acceleration with formation of MRCC and inspection report, followed by various field surveys and ward demand for various transportation project. The prioritization criteria along with hierarchy of road has been formulated and later the prioritized road along with required intervention is proposed for the MTMP period based on financial aspects as highlighted in Table 1 and Figure 2 respectively.

Table 1: Adopted Methodological Steps of MTMP

Activities	Description
1	Assist in Formulation of Municipality Roads Coordination Committee
2	Secondary Sources of Information and Review of the existing MTMP
3	Accessibility Data Collection and Analysis
4	Prepare the Indicative Municipality Development Potential Map (IDPM)
5	Prepare the Municipality Inventory Map (MIM)
6	Collection of Demands for New/Upgrading/Rehabilitation Transport Linkages from Wards/Settlements
7	Developing Scoring Criteria and its Approval from Municipality
8	Road Classification and Nomenclature
9	Preparation of Perspective Plan of Interventions of Services and Facilities
10	Analyze Fund Availability for Roads
11	Preparation of the Municipality Transport Master Plan (MTMP)
12	Prepare a Realistic Physical and Financial Implementation Plan of Prioritized Roads for the MTMP Period

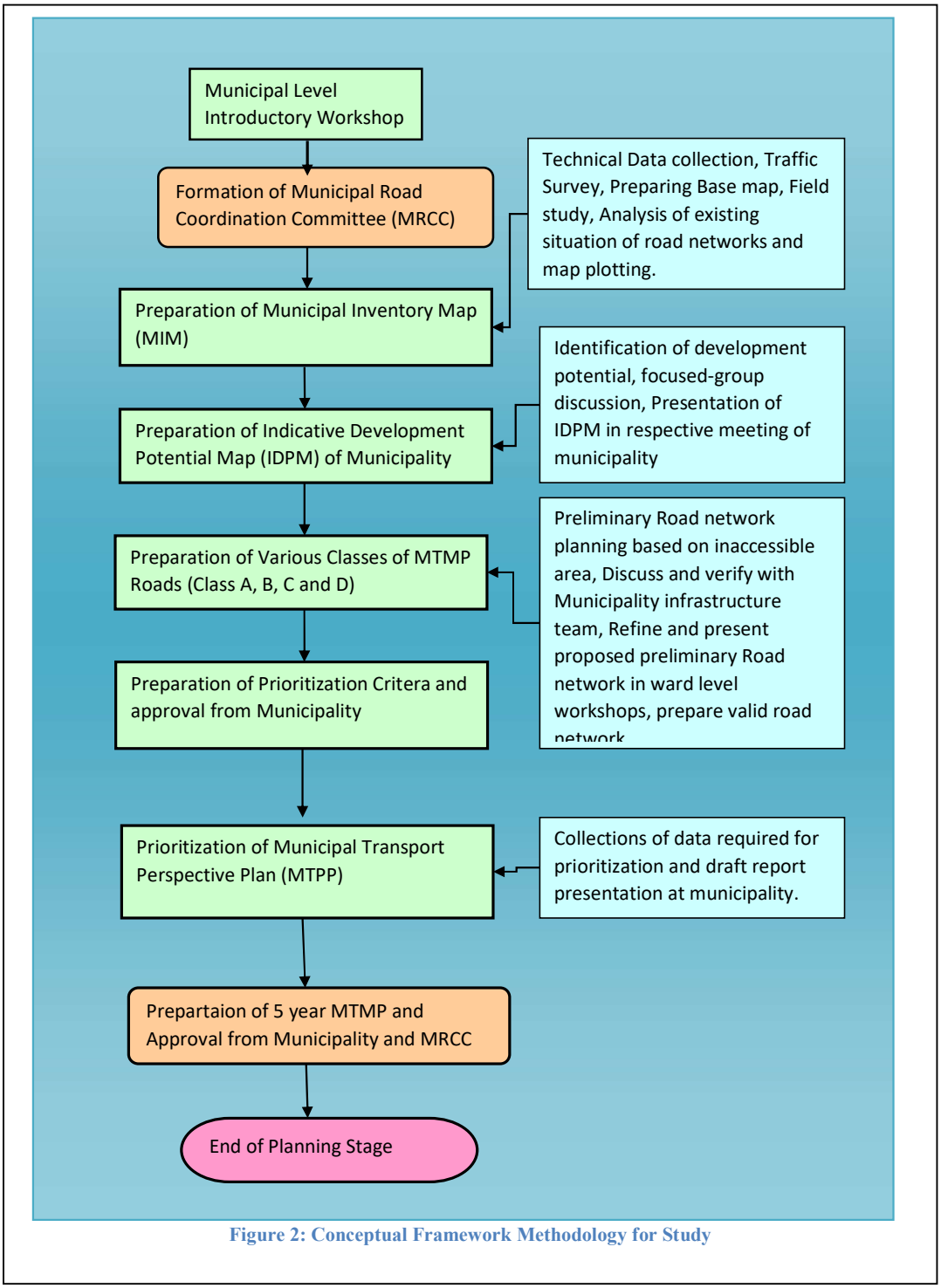


Figure 2: Conceptual Framework Methodology for Study

2.3 Stakeholder Meeting

The success of the project depends on the rigorous interaction between stakeholders. The initiation of field work started after an "IUDP of Dhulikhel Municipality Kick off Program"

held on Mangsir-4, 2074 with various concerned stakeholders, involving representatives from different political parties and ward representatives. The meeting briefly introduced MTMP, though Municipality Road Coordination Committee (MRCC) could not be formed. Then after, on various dates meetings were organized to present the work progress. Simultaneously, presentations of Field and Draft Reports respectively were also submitted to the municipality office with the stake holders.

2.4 Fieldwork

Fieldwork was the second stage in the preparation of MTMP, after tablework (preliminary planning). A team of three, a transportation engineer and two civil engineers, were involved to conduct different surveys. The primary data collection methods carried out in the field are:

- Origin and Destination Survey
- Road Inventory Survey
- Demand Survey
- Public Transport and Services Study

Household interview method was used to conduct the Origin and Destination survey. A mobilized team went to each household and asked each individual of the household to respond to a questionnaire reflecting personal, household and trip making characteristics. A Road inventory survey was conducted to collect data on road condition, road linkage, road safety status and issues that need to be highlighted. Demand surveys were conducted by asking the representative of each ward will to complete a demand survey form, to understand the demands of new facilities or interventions to improve existing roads.

2.4.1 Origin and Destination Survey

The Origin and Destination study, a method of household (HH) survey, was conducted in all wards of Dhulikhel Municipality, to collect data on socio-economic status, HH characteristics and trip making characteristics. Total of 55 households were sampled randomly and the responses of 116 people were collected.

Motor-Bike riding and Walking were the modes used for data collection purpose. The socio-economic details include monthly income, occupation and educational status and vehicle ownership level. Trip characteristics included origin and destination of trip, trip purpose and mode, trip time and accessibility to nearest bus stop.

2.4.2 Demand survey

An interaction session with the members of ***wards elected representatives*** and other representatives was conducted in each ward and were asked to fill up the demand form after small briefing. The demand form highlighted major roads and their priority given by the wards along with detail of other planned development projects as: drinking water, irrigation projects, tourism development areas, agriculture farms, animal husbandry, school and campus building construction etc.

2.4.3 Road Inventory Survey

A road inventory survey was conducted to assist the preparation of the Municipality road inventory map and also to present the existing road safety situation. Details of all the roads with a width greater than 2.5 meters were collected during the survey. Details included name of the road, nodal points (where applicable), right-of-way, carriageway width, type of road, length of the road, number of cross drain structures, road surface condition and intervention required.

Road safety emerged as a serious issue. Pedestrians and motorists are the most vulnerable road users and the same scenario exists in Dhulikhel too. The road inventory, from a road safety perspective, will help to inform various road safety measures. As observed, all road users share the same road space, i.e. no provision of separate footpath, cycle track or even zebra crossing. Traffic rule enforcement level is also found to be too low.

2.4.4 Public Transport and Services Survey

Transportation is the backbone of development. All households cannot afford private vehicles and therefore accessibility to public transportation is critical for the betterment of the Municipality and its communities. The present transportation network, frequency of public transportation at various routes, location of bus stop and terminals, location of various services and facilities were assessed. Also, to highlight the accessibility to public transport, time required to reach the nearest bus stop from each household (sample) was also obtained from household interview methods. The various types of transportation modes available within the Municipality were also noted.

2.5 Secondary Data

Secondary data was collected from the annual report published by the Municipality office and consultation with stakeholders. Field studies were carried out for general socio-economic assessment of the Municipality. Information regarding demographic data, maps, service flow patterns, various maps showing service centers or the location of SOR (Service of Road) facilities, transport infrastructure inventory, past plans and sector study reports, sector standards and policy targets were collected from the secondary sources including Bureau of Statistics, Kathmandu, Survey Department, Local NGOs, line agencies, DDC, etc. The following documents were reviewed during secondary data collection:

- Municipal periodic plan
- Report on settlement pattern and market centers of the Municipality
- Digitized topographic maps of department of survey
- District administrative map
- District Trail Maps, Helvetas / TBSU
- Strategic road network map
- Satellite images

2.6 Application of GIS for Preparation of Maps

GIS software was used for the preparation of different maps and database of the municipal roads and other details. GIS maps, prepared for Municipal Transport Master Plan (MTMP), are summarized in the following points:

a. Preparation of map

Shape files for Ward Boundary, Municipality Boundary, District Boundary, Province and Development Region Boundary were obtained from the Department of Survey. The boundary for New Municipalities were generated by merging the previous VDCs using the Dissolve tool in Arc GIS. The Ward boundaries within the Municipality were also generated in similar manner. Satellite images of the Municipality were obtained using Image Capture Software and Google Earth. A .kml file was used to obtain an enclosed area for image capture using Google Earth. After the image was captured, layers for land use, road, buildings, etc. were digitized.

b. Data Entry and field verification and Preparation of Maps

After Ward and Municipal boundaries and other necessary data was obtained, data entry for roads and place name was prepared. For Roads, fields were added in a table including total width, carriageway width, road surface type, road name etc. Data obtained from the field inventory and verification for roads, land use was manually entered for all roads using Editor Tool in Arc GIS. GPS was also used for recording place names, buildings, culverts and bridges in the field. The GPS data was converted using "GPS Conversion tools" and then used in Arc GIS. After field verified data was entered then map preparation was done. All the maps are prepared in Arc GIS version 10.2.2. Symbols for Road classes have been used as described in Terms of Reference (ToR) provided by MoFALD.

Coordinate System Used:

Projected Coordinate System	Modified_UTM84
Projection	Transverse Mercator
False Easting	500000
False Northing	0
Central Meridian	84
Scale Factor	0.9999
Latitude of Origin	0
Linear Unit	Meter

Geographic Coordinate System	GCS_Everest_1830
Datum	D_Everest_Adj_1937
Prime Meridian	Greenwich
Angular Unit	Degree

Geocentric Translation:

1. from GCS_WGS_1984 to GCS_Everest_1830:

dx: -295.000000 dy: -736.000000 dz: -257.000000

2.7 Preparation of Municipal Transport Master Plan

2.7.1 Preparation of Municipal Inventory Map (MIM)

The following steps were undertaken in the preparation of the MIM report

- The inventory of the existing roads was carried out and necessary interventions such as new construction, rehabilitation, periodic maintenance, regular maintenance etc. were identified using Global Positioning System (GPS) tracking of existing roads.
- Information on road surface type, traffic levels, status of pass ability, status of construction, adequacy of bypasses, existing bridges and their requirements, status of drainage and other improvement required was collected during inventory survey.
- Presentation on MIM and IDPM was made in one day meeting with MRCC. This meeting then finalized the proposed IDPM and MIM plans were agreed. The required interventions were analysed based on accessibility situation. Presentation on MIM and IDPM was made in one day meeting with MRCC. This meeting then finalized the proposed IDPM and MIM plans.
- Urban roads identified are categorized into four class of roads i.e. Class A, B, C & D.
- Prior to disseminating information in clusters of ward level workshops, MRCC meeting was conducted and the proposed preliminary road network plan for inaccessible areas was presented and discussed to verify and obtain preliminary approval of the proposed road networks.
- All suggestions and feedback was collected from MRCC meetings and incorporated into the preliminary proposed road network plans. A Preliminary Road Network Plan was presented and discussed in a series of municipal-level workshops to collect the views of the participants and proposal for MTPP. The Road Network Plan was finalized in the workshop. Plenary discussion was organized to verify the views of local participants on new demands as well as existing road networks.

2.7.2 Preparation of Physical Development Plan (PDP)

The Physical Development Plan, prepared as part of the IUDP process (IUDP Volume 2) is the 20-year plan showing the settlement hierachy of the existing and potential market centre/service centres (key growth centres) and the areas proposed for future urban development to accommodate new population over that time. The PDP also shows the land use and areas of

development potential including high value cash crops, agro-based industries and tourism. Thus, PDP is the culmination of all land uses, areas of social infrastructure, growth areas and locations of historic and religious places and other places of tourism interest.

PDP (included in Volume 2) was prepared in consultation with the Municipality and MRCC, along with representatives from wards. The PDP was prepared in the context of planning policy statements for sustainable development and land supply and demand projections to accommodate development over the coming 20 years.

2.7.3 Preparation of Five-Year Municipal Road Master Plan

The MTPP was used as the primary document to prepare the Municipality Transport Master Plan. The available financial resources of the Municipality and previous expenditure on the urban transportation sector was assessed considering past trends. Budgets were then forecasted for the coming five years. Moreover, a tentative budget plan for the coming five years was prepared in consultation with the Municipality, the interventions and road linkages identified in the MTPP were prioritized, high scored roads were selected for the coming five years plan.

2.8 Scoring Criteria and Prioritization

Development of the scoring criteria and prioritization criteria was based on the provided guidelines, with some modifications based on field meetings, and have been approved. The guidelines are summarized in later in this report.

CHAPTER 3: STUDY AREA – EXISTING CONDITIONS

Dhulikhel Municipality lies in Kavrepalanchok District, Province no 3 of Nepal. It lies in Central Nepal; geographical coordinates are 27° 36' 992 North, 85° 33' East, at an altitude of 1505m. It is located at the eastern rim of Kathmandu Valley, south of the Himalayas and is situated 30 km southeast of Kathmandu and 74 km southwest of Kodari.

Dhulikhel Municipality was established in 2043 B.S. and constituted 9 wards (Area=14.01 Sq. Km.). Following restructuring, the Municipality was expanded to 12 wards, with a total area of 54.62 square kilometres. It was restructured on Falgun, 2073 B.S. merging one existing municipality and five existing VDCs i.e. Dhulikhel, Raviopi, Devitar, Sarada Batase, Paatlekhet, and Sankhupati chaur. The Population Census 2011 of Nepal counted 32,162 persons in 7,061 households of Dhulikhel Municipality (9 wards).

Two major highways, B.P. Highway, also known as Banepa Bardibas Highway, and the Araniko Highway, pass through Dhulikhel effectively dividing the municipality into three equal parts. Araniko Highway connects Kathmandu, Nepal's capital city, with Tibet's border town of Kodari. It has been an important trading centre on the commercial route linking Nepal to Tibet for centuries. BP Highway links Kathmandu Valley with the Eastern Terai Region. The convergence of the two major highways in Dhulikhel makes Dhulikhel a strategically important city.

Dhulikhel Municipality is bordered by Kavre V.D.C in the east, Panauti Municipality in south, Banepa and Pachkhal Municipality to the north and Banepa Municipality in the west.

Table 2: Newly structured Dhulikhel

Ward. No.	Included VDCs/Municipalities	Included Wards
1.	Devitar	1-3, 6-9
2.	Rabi gaun	1-5
3.	Dhulikhel	6
4.	Dhulikhel	7
5.	Dhulikhel	8,9
6.	Dhulikhel	4,5

7.	Dhulikhel	2,3
8.	Dhulikhel	1,13
9.	Dhulikhel	10-12
10.	Sharada Batase	1,2,5,6-8
11.	Patle khet	1-9
12.	Shankhu Patichaur	1-3,5-9

3.1 Socio-economic and demographic status

The present and projected socio-economic and demographic status play a vital role in shaping the cities. Thus, it is necessary to forecast this data based on the present data and their change (increase/decrease) pattern. Population, household structure and their characteristics are some of the major pillar for better understanding of the locality.

3.1.1 Population and population density

According to the census of 2011, the population of Dhulikhel Municipality is 32,162 with household number 7061. The population density of Dhulikhel Municipality is 1017 people per square kilometres (although the density distribution varies greatly between the rural areas and the urban areas as shown in the table below).

Table 3: Ward Wise Population and Population Density

Ward no.	Household	Population			Area(sq.km)	Density
		Total	Male	Female		
1	460	2143	964	1179	6.132437	349.4532
2	542	2548	1193	1355	8.510152	299.4071
3	558	2401	1214	1187	2.743233	875.2446
4	820	3195	1715	1480	1.55272	2057.679
5	354	1751	856	895	0.672229	2604.766
6	439	2002	976	1026	1.007136	1987.815
7	722	3118	1487	1631	1.982098	1573.081
8	746	3553	1718	1835	8.640914	411.1833

Ward no.	Household	Population			Area(sq.km)	Density
		Total	Male	Female		
9	682	3190	1438	1752	4.92777	647.3517
10	317	1430	654	776	2.97932	479.9753
11	806	4009	1946	2063	10.11825	396.2149
12	615	2822	1323	1499	5.352995	527.1815
Total	7061	32162	15484	16678	54.619	

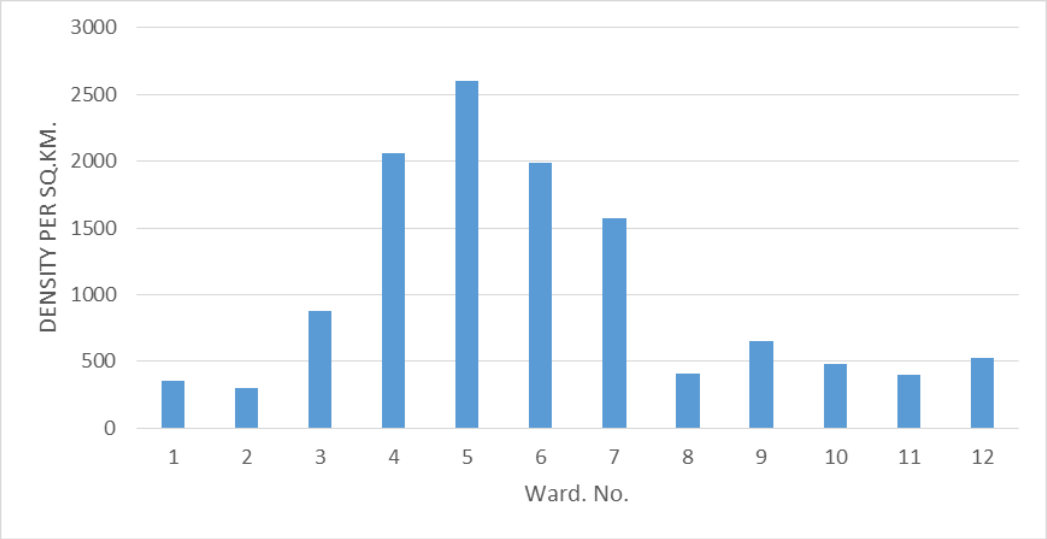


Chart 1: Population Density per Ward

Based on Table 3, we can clearly see population density lies in the range of just 299 person per square kilometre to 2,604 persons per square kilometre. Less population density is found in Ward 2 having area in the range of 8.51 sqaure kilometres respectively, whereas the highest population and population density is found in ward 5 with area of 0.67 square kilometre. There is a higher proportion of females compared with males in all wards, as shown in above table. 16,678 (51.86%) people are female among 32,162 total residents (Census, 2011).

3.1.2. Household Structure:

According to Merriam Webster Dictionary, 'Household' is defined as those who dwell under the same roof and compose a family.

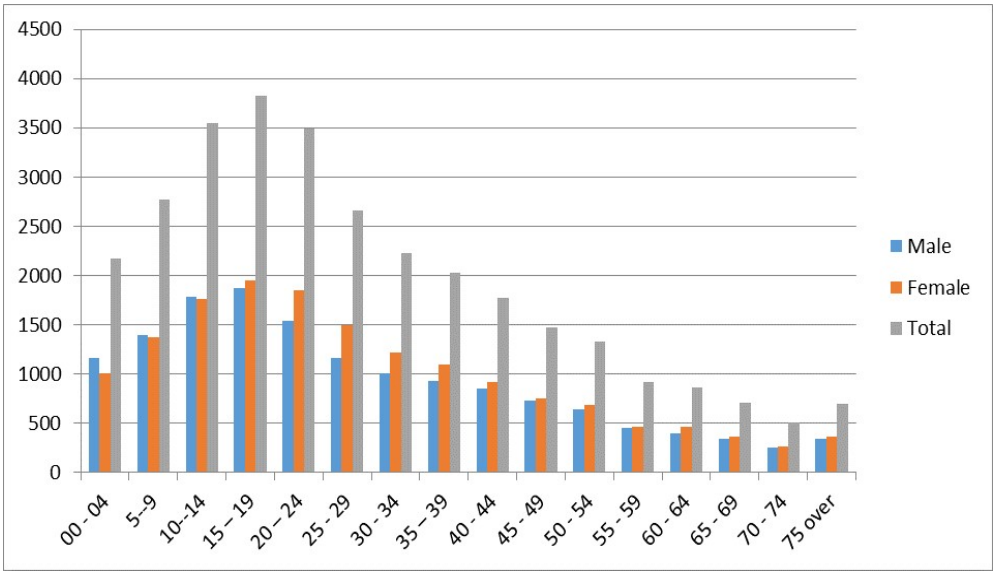


Chart 2: Population Distribution based on Age-group

The age distribution of 116 sampled data is shown in above chart. The highest proportion of sample population lies in age group of 15-19 followed by age group of 10-14.

3.1.3 Educational Status

The developmental status of the Municipality is governed to large extent by the educational and occupational status. The higher the educational level of the residents, the high the level of development. From the data collected from CBS we can say that only few people from this Municipality have completed higher study. The educational and occupational status of the sampled population is highlighted in the subsequent charts respectively.

Table 4: Education Status

Dhulikhel Municipality	Population aged 5 years and above	Population who				
		Can read and write	Can read only	Cannot read and write	Literacy not stated	Literacy rate
Both sex	28827	21736	564	6506	21	75.40
Male	13803	11832	236	1732	3	85.72
Female	15024	9904	328	4774	18	65.92

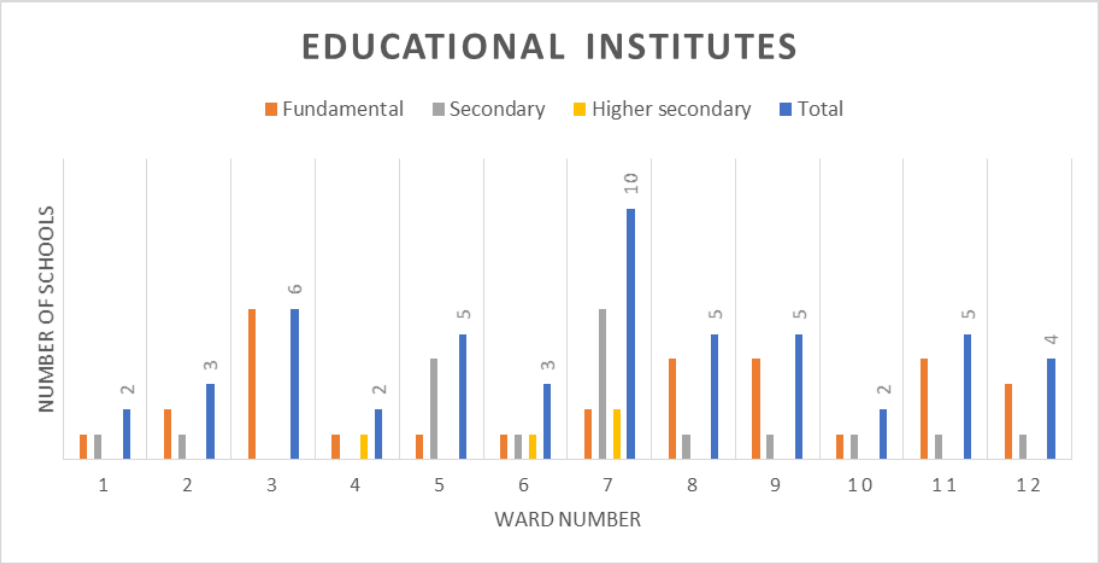


Chart 3: Education Status

3.1.4 Vehicle ownership Status

Vehicle ownership has a great role in trip making. The higher the number of personalized vehicles, the higher the number of shopping and social/recreational trips. Based on data provided from sampled data, we found that most households do not own any private vehicle, with a minority of households owning their own vehicle.

3.1.5 Economic Status

The annual and/or monthly earning of each household has significant role in the trip characteristics and finally on the overall planning aspects of the locality. The higher the income, the more likely they may own their own vehicle. The proportion of population in various income group are being summarized in chart below.

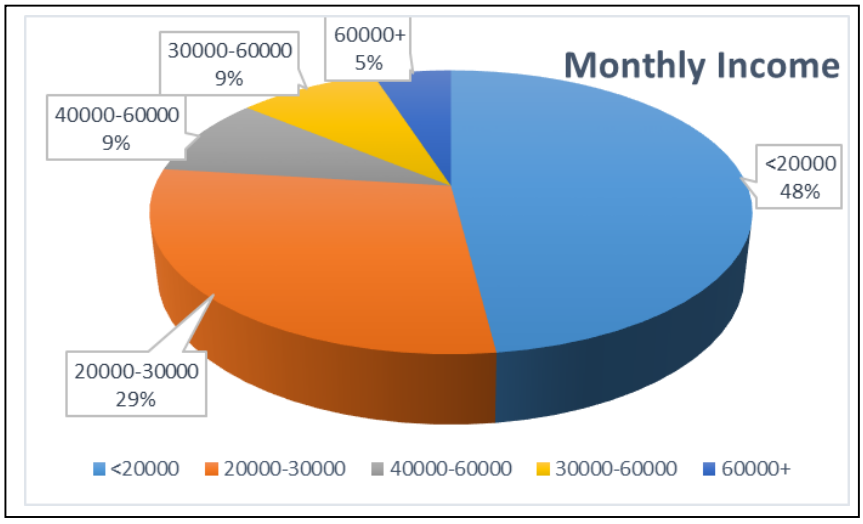


Chart 4: Economic Status

The above figure shows that the majority of the households (nearly half of the sampled households) of the Dhulikhel Municipality have a monthly income less than NRs. 20000 and around one third have monthly income of around 20000-30000.

3.2. Trip Characteristics

Any journey undertaken by any mode/means of transport having a definite origin and destination and having some sort of purpose is called a "trip". Trip characteristics differ from locality to locality and even household to household. Hence, it is important to analyse the trip characteristics of the municipality.

3.2.1 Trip Purpose and Mode

Based on the day to day activities of the people living there we can predict most of the trips will be done for educational and shopping purpose. Based on the traffic data that we have collected from the Department of Roads we can predict that the people use walking modes for short trips and for long route trips they use the long route vehicle which passes through the highway.

Based on the chart shown here we can say that people here travel either for education, office or for shopping only.

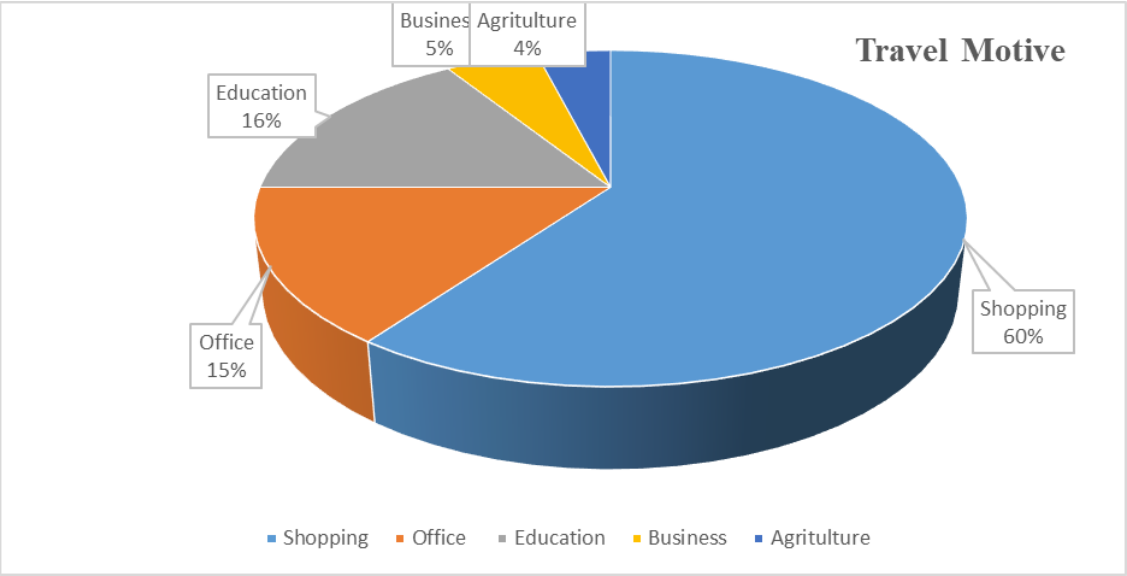


Chart 5: Travel Motive

As most of the wards are connected with SRN and DRCN roads, there is satisfactory public transportation facilities.

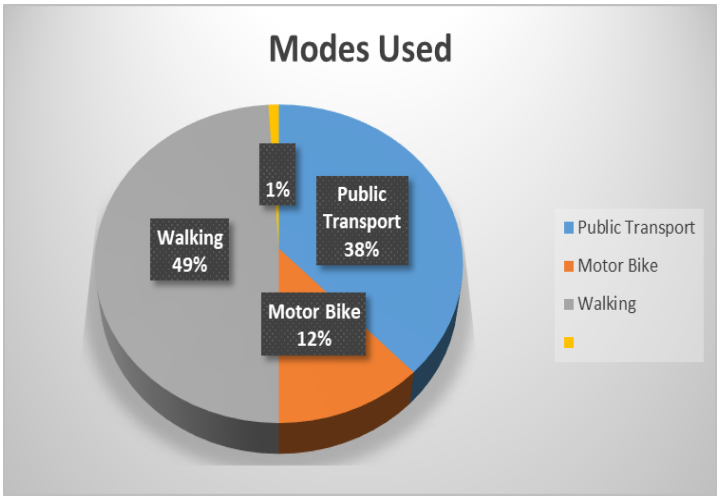


Chart 6: Mode Used in Travel

Analysing the mode used for various trip purposes, we came to the conclusion that people are mostly using walking mode for shopping and education purposes. For almost every trip, walking mode is used and in general people are using walking mode more than public transport mode. Nearly 13% people use their own private vehicles.

3.2.2 Origin and Destination Study

Trip, also called journey, is the process of going from one place to another with some purpose. Thus, trip is characterized by origin (starting point) and destination (ending point). To be more precise, trip is characterized by trip production and trip attraction. Home end is always trip production and the locations which attract the produced trips for various causes (job, shopping, education and entertainment) are attraction end of trips. Most of the trips are home-based trips with different destination. Out of 116 respondents surveyed almost every respondent makes trips for some purpose. Trip chaining, going at various destination points in the form of chain in a single day, was rarely found in the study area. Dhulikhel and Kathmandu are the major destinations made by the locals.

3.3 Accessibility and Mobility Scenario

Accessibility refers to the ability to reach desired goods, services, activities and destinations. Provision of small trail roads, cycle track, provision of public transportation and proper road network with last mile connectivity help us to ensure accessibility.

Although walking is the dominant mode in that region based on secondary data, the main thing that needs to be considering for better accessibility as well as mobility is the public transportation network and their frequency. One factor that needs to be considering for better planning is the average time required to reach the bus stop from each HH and aggregating them at least in ward basis to set up priority. The sample data were analysed on ward to ward basis and the time range for a ward to reach the nearest bus stop is summarized in Chart below.

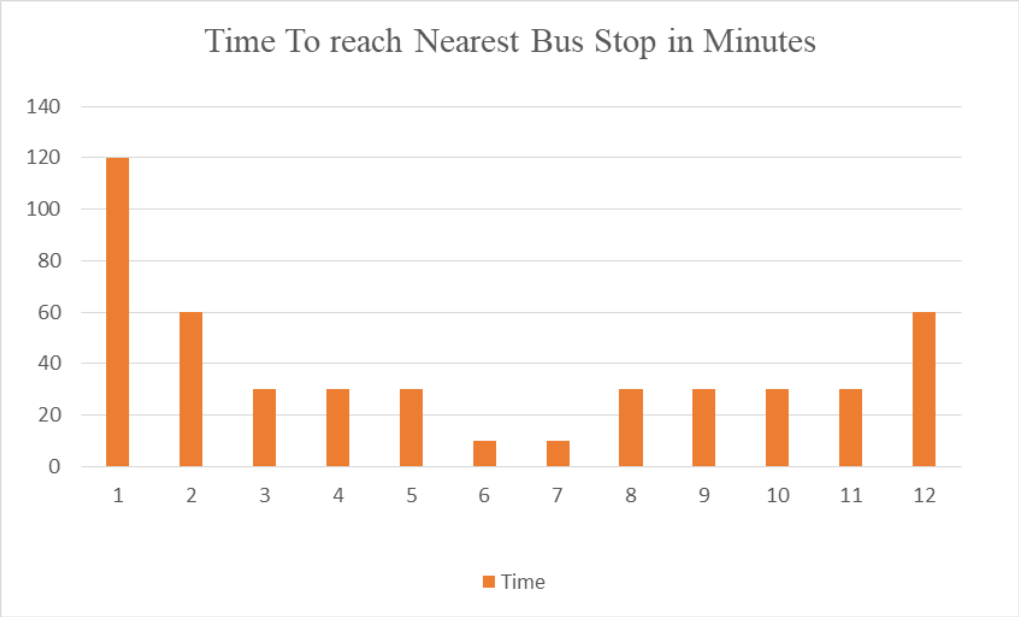


Chart 7 : Time to reach the Nearest Bus Stop

Based on the table above we can say that the accessibility of public transportation in most of the wards is satisfactory except in wards 1 and 12, being in the highest and 2nd highest rank in the chart. Most of the wards are connected either by SRN or DRCN roads. But the mobility of vehicles is not satisfactory except in SRN. Most of the DRCN, urban and village roads lack mobility of vehicles.

Very few foot paths along the road have been identified in the municipality. Even SRN and DRCN roads lack footpaths. Although walking mode dominates all other modes, the condition of footpaths and other facilities for pedestrians has not been provided. This finding does not mean that the municipality completely lacks footpaths. Some of the roads in bazar areas are provided with footpaths. But they are not of standard size and are not maintained properly in the long run.

These few footpaths are all inadequate for disabled access. To deal with this problem, the technical section of the municipality should require road designers and contractors to follow standard DoR guidelines at the time of designing and constructing the road within the municipality.

3.4 Road and Traffic Scenario:

As elsewhere in Nepal, road transportation is the dominant and only mode of movement in this Municipality. There are total 4 SRN roads among which two are major highways ie. H-03 (Araniko Highway) and H-06(BP Highway). The total length of SRN road in the municipality is 25.22 Km. Araniko highway passes through wards 3,4,7,8 and 2. While BP highway passes through wards 6, 7,9,10 and 11. While there are other two feeder roads, F-72 and F-73, which passes through wards 4, 5 and 12.

Furthermore, there are six district roads (the core road network) passing through the major settlements of the municipality. This road Network joins village settlements or nearest economic centers to the district headquarters via either neighboring district headquarters or via the Strategic Road Network. A list of the district roads passing through the municipality are:

Table 5: List of DRCN Roads

S.N	Name of Roads	Connection of Road
1	24DR009 Banepa - Raviopi-Panchkhal	This passes through ward no 9 of Dhulikhel Municipality. This road connects various settlements of ward number one and two with Banepa Bazar (Banepa Municipality) and Anaikot bazar (Panchkhal Municipality)
2	Ravi Opi (Dundamukh)-Devitar-Anekot (Ghumaunichour)-	This road connects settlements in ward number one and two with district road 24DROO9 and DR013 which

	Nayagaun (24DR012)	further connects the settlements with Banepa and Anaikot respectively
3	Kavrebhanjyang - Faskot - Inte-Sankhu Fendi -Shyampati Kuru Gaun – Bhalu Kharka – Baseri (24DR018)	This road connects settlements in ward number 9 and 10(Batase, Patalikhet, KavreNityachandeshwori) with Batase Sankhu-Namobuddha Road(F72)(Panauti)
4	BP Highway - Sharda Batase - Inte (24DR019)	This road connects ward no 10 with BP highway and Batase Sankhu-Namobuddha Road(F72)(Panauti)
5	Kavrebhangyang-Dapcha-Pipaltar-Sikhar Ambote-Sanjhakot-Tara Khase Lekh Gokule (24DR020)	This road connects settlement in ward number 11 with b.p highway via dr0018 in the north, likewise this road connects Dhulikhel municipality with Namobuddha Municipality to the south.
6	Tinpiple - Kalchhe- Bela (BP Highway) (24DR025)	This road connects settlements in ward number 11(kalchhebesi) and Panchkhal Municipality with BP highway to the south and Araniko highway to the north

As observed, most of the roads are earthen, with very few gravelled. This means that they are not all-weather accessible. SRN and some of urban roads are only blacktopped /bituminous. While the road network is quite satisfactory, there is a lack of reliable and systematic public transportation.

3.4.1 Road inventory

Road inventory was undertaken manually and the total length of roads surveyed was 291.64 Km. A number of cross-drainage structures were found in the entire road network, with culverts being the most common followed by some causeways and bridges. Except SRN and some of DRCN roads, most of the roads surveyed were earthern and few are gravelled. Less percentage of bituminous roads (only SRN) in urban area indicates that the Municipality needs to do a lot of work regarding road construction.

The total width of roads, including the shoulder, side slope and drainage structure were found to be within range of 2.5 to 12m. Based on the inventory, it was found that, most of the roads were of width 3-4 m. Many of the roads require immediate attention and need to be maintained and many earthen roads need to be updated to gravel (to make them all-weather accessible) and some gravel roads need to be updated to bituminous road based on the present need and traffic volume. Further, the road infrastructure lacks proper furniture such as traffic sign, separate footpaths, proper side rails, shoulder, zebra crossings, and drainage and so on.

Figure 3: Road Inventory 1

Figure 4: Road Inventory2

Five SRN Roads passes through this municipaility, which are shown in the table below.

Table 6: List of SRN

SRN Roads	Passing Wards
Araniko Highway	2,3,4,7,8
BP Highway	6, 7,9,10,11
F-72	12
F-73	4,5
F-02902	5

Ward_no	SRN Length in each Ward (KM)
W-9	3.804
W-8	2.814
W-7	3.376
W-6	0.947
W-5	1.692
W-4	3.158
W-3	0.606
W-2	1.651
W-11	4.81
W-10	0.611
W-12	1.745
Total	25.214

Table 7: Length of Roads Ward Wise

Ward	Length of various type of roads (Km)			Grand Total
	Bitumen	Earthen	Gravel	
1		22.80	6.69	29.48
2	1.65	34.54	7.35	43.54
3	2.71	9.57	2.38	14.65
4	8.14	0.96	1.89	10.99
5	2.83	2.08	3.34	8.25
6	5.75	1.06	0.52	7.33
7	8.41	2.33	1.66	12.39
8	3.17	44.10	1.27	48.54
9	3.80	21.49	4.81	30.10
10	0.61	7.28	3.35	11.24
11	4.81	45.17	5.96	55.94
12	1.75	16.42	1.02	19.19
Total	43.63	207.785	40.22741	291.64

3.4.2 Road Density:

Different wards have different road networks, some have higher density road network within small area whereas some has low density network in large area. Road density is the major parameter that is used to reflect the development of road within the considered area. Higher value of which, represent higher level of settlement or high development. Thus, road density is usually defined in two perspectives, first length of road per square kilometre area, whereas second as length of road per 1000 population.

Table 8: Road Density

Ward	Population	Area (sq.km.)	Road Length(Inventory Road + DRCN + SRN) (Km)	Road Density per	
				Total area	1000 population
1.00	2143.00	6.13	29.48	4.81	13.76
2.00	2548.00	8.51	43.54	5.12	17.09
3.00	2401.00	2.74	14.65	5.34	6.10
4.00	3195.00	1.55	10.99	7.08	3.44
5.00	1751.00	0.67	8.25	12.28	4.71
6.00	2002.00	1.01	7.33	7.28	3.66
7.00	3118.00	1.98	12.39	6.25	3.98
8.00	3553.00	8.64	48.54	5.62	13.66
9.00	3190.00	4.93	30.10	6.11	9.44
10.00	1430.00	2.98	11.24	3.77	7.86
11.00	4009.00	10.12	55.94	5.53	13.95
12.00	2822.00	5.35	19.19	3.58	6.80
Total	32162.00	54.62	291.65		

Ward No. 5 has the highest and 12 has the lowest road density considering total area. While ward 11 has the highest and ward 4 has the lowest road density considering total population.

3.4.3 Road demand:

Each Ward was requested to completed "Demand forms" to understand the priority of road development from the point of view of the local user. They were asked to rank the top five roads in their wards or vicinity so as to ensure betterment of the ward. Most of the roads were identified as needing upgrading with some some roads requiring new construction. The roads were demanded to help all community users.

Table 9: Details of Prioritized roads in each ward

Ward no.	S.N	Name of the Road	Surface type	Upgrading Necessity	Existing Width (m)	Req. Width (m)	Population/Settlement Served	Priority order
Ward *1*	1	Dudakomukh-Zero Km-Devitar	New construction	yes	5	12	200/7	
	2	Rabi-Deurali-Chamor	Earthen	yes	5	10	900/4	
	3	Milanchowk-Bhadaure Danda-Anaikot	Earthen	yes	5	10	1000/5	
	4	ThinKhola-Watadanda-Kasivhanjyang	Earthen	yes	4	8	600/5	
	5	School Danda-ShimleChaur-Chihan Danda	Earthen	yes	4	8	500/5	
Ward *2*	1	Chahare khola ko pakha bata duieeKhola	New construction	-	-	10		1
	2	Chisapani-Dhunganatole-Jamare-SIkharkatti-Karkipati-Bajrapare-Sabtrichaur	New construction	yes	3	7	1000/8	2
	3	Chapleti hudai Dhulikhel Municipality ward no. 1	Earthen	yes	3	9	500/6	3
	4	Chapleti-Chamor	Earthen	yes	5	9	1500/6	4
	5	Sishnekhola-Thimi Gaun	Earthen	yes	5	9	1000/5	5
Ward	1	Dhulikhel-Rabi-Devitar	Earthen	yes	4	11	600/4	1
	2	Panchakanya-Acharyagaun-Kutal-Rabigaun	Earthen	yes	3	9	500/3	2

Ward no.	S.N	Name of the Road	Surface type	Upgrading Necessity	Existing Width (m)	Req. Width (m)	Population/Settlement Served	Priority order
3	3	Dhulikhel-Rabi-Nagarkot	Gravel	yes	3	9	300/2	3
	4	Panchakanya-Napabasti-Panchkhal	Earthen	yes	3	9	500/3	4
	5	Napagaun Bato	Earthen	yes	3	9	500/1	5
Ward. *4*	1	28 kilo- KU- Shrikhandapur	Earthen	yes	11	11	400/4	5
	2	Aghori Baba Marga	Earthen	yes	11	11	200	1
	3	Dhulikhel DMI hudai Chukunepati Jane Bato	Half Earthen	yes	11	11	300/5	4
	4	Bansgahri Hudai chukune pati jane bato	Earthen/track(New cons.)	yes	11	11	400/4	2
	5	Purkutitole-Muktimarga-Chaukot	Earthen	yes	11	11	300/2	3
Ward *5*	1	Gandhivchowk-Kuschowk	Gravel	yes	18	18	3000	1
	2	Punyamata-Thapaliyachowk	Gravel	yes	11	12	1000	2
	3	BP Rajmarg-Prakash Pustakalya-BP Rajmarg	Gravel	yes	11	12	1000	3
	4	Punyamata Khola Corridor	New Construction	-	-	30	-	4
	5	Hulak-Biscuit Karkhana	Gravel	yes	11	15	500	5
Ward *6*	1	(Buspark-Gitamarga)-takhusi-Jarandadachowk	Black top miserable	yes	12	12	100/4	1
	2	Lakhanamai Mandir-Suwaltol-Muktimarga	Black top miserable	yes	12	12	1200/5	2
	3	Pipaltole Bot-BP Rajrmarg- Rajkulo-Suwaltoleko Pul-Takhusi-Jarandadachowk	New construction	-	-	15	Total ward	3
	4	Buspark-Gitamarga-Jaran Danda	Black-top	yes	<6	6	1000	4
	1	Saraswati Bazar-Adda Bazar(Pipal bot samma)	Black-top	yes	4.5	6	700/2	
	2	Saraswati Bazar-HurkhaMarga Hudai-	Earthen	yes	11	11	200/3	

Ward no.	S.N	Name of the Road	Surface type	Upgrading Necessity	Existing Width (m)	Req. Width (m)	Population/Settlement Served	Priority order
		BP Rajmarga						
Ward *7*	3	Saraswati Bazar Hudai Dhurkha Marga- Thado Oralo-BP Rajmarga	Earthen	yes	4.5	6	200/4	
	4	Saraswati Bazar- Gutuchha Marga Hudai-BP Rajmarga	Earthen	yes	4.5	6	50/3	
	5	Mukhya Sadak Marga Bata-Nagarpalika Hudai Suparitar-Sanjivani School	Earthen	yes	4.5	6	300/4	
Ward *8*	1	Pipalbot-Bhattedanda-KavreBhanjyang	Earthen	yes	3.5	11	100/7	2
	2	Khawa-Sikharkateri-Kalchhe	Earthen	yes	3.5	11	1200/6	1
	3	Khawa-Saraswati Mavi-Kavrebhanjyang	Earthen	yes	3.5	11	1000/6	4
	4	Pakucha – Dovan	Earthen	yes	3.5	11	600	3
	5	Thakle- CHpludevi	Earthen	yes	3.5	11	200	5
Ward *9*	1	KavreBhanjyang Darimbot Hudai Majuwakhola	Earthen	yes	5	12	1000/4	1
	2	Devisthan-KavreGaun Hudai Kavrebhanjyang	Earthen	yes	4	12	3000/4	4
	3	Ghatkhola-Ranachhap-Thulochaur	Earthen	yes	4	12	400/3	3
	4	Ramchechaur koiralatole Phapaltole hudai DanfeKhola	Earthen	yes	4	12	600/5	2
	5	Pani Tyanki-Humagai Tole Hudai Hulakpari	Earthen	yes	4	12	250/4	5
Ward *10*	1	Bphighwa Sarada Batase eete Sadak	Earthen	yes	8	12	2500/7	1
	2	Krishna Mandir Bata Faskot	Earthen	yes	8	10	700/3	5
	3	Tinchhuchhe Pokharai Bata Bhairavghat saama	Earthen	yes	8	10	500/3	2
	4	Pipalbot Batta Dhunge Ban	Earthen	yes	8	10	400/4	3
	5	PingDanda bata eete jodne baato	Earthen	yes	8	10	1500/3	4

Ward no.	S.N	Name of the Road	Surface type	Upgrading Necessity	Existing Width (m)	Req. Width (m)	Population/Settlement Served	Priority order
Ward *11*	1	Gumba-Araniko Road	Earthen	yes	7	9	3000/15	1
	2	Sunwartole-Tinpipple	Earthen	yes	7	9	4000/16	2
	3	Jukepokhari-Dovane	Earthen	yes	6	7	800/11	3
	4	Kavrebhanjyang-Thatithok-Phulbari	Earthen	yes	6	7	2000/7	4
	5	Maskale-Thulitar -Pipalthumki	Earthen	yes	6	7	1500/12	5
Ward *12*	1	Lamichhane Gaun-Sallepani Pakha-Kuikel thumka	New construction	-	-	15	800	1
	2	Eete-Patichour-Piple sadak	Earthen	yes	6	15	1200	2
	3	Thumka Sadak Namobuddha Lodge Danda	Earthen	yes	6	15	150	3
	4	Sankheswori-Tallo Eklekhet Sadak	Earthen	yes	6	15	400	4
	5	Eklekhet-Dhankali-Fending	Earthen	yes	6	15	400	5

3.4.4 Road Safety Status:

Road accident is one of the critical issues in Nepal and it is not addressed properly in this Municipality too. Most of the roads were not maintained properly. Lack of traffic sign is witnessed in the Municipality and no speed limits apply to local roads. Also, despite walking being the most dominant mode, they are often treated as step children. There is no any provision of separate footpath for pedestrian and hence, pedestrians are forced to share the same road space with other vehicle.

Very few foot paths along the road have been identified in the municipality. Even SRN and DRCN roads lack footpath. As walking mode has dominated all other modes, though the condition of footpaths and other facilities for pedestrians haven't been provided. But it doesn't mean that municipality completely lacks footpath. Some of the roads in bazar area

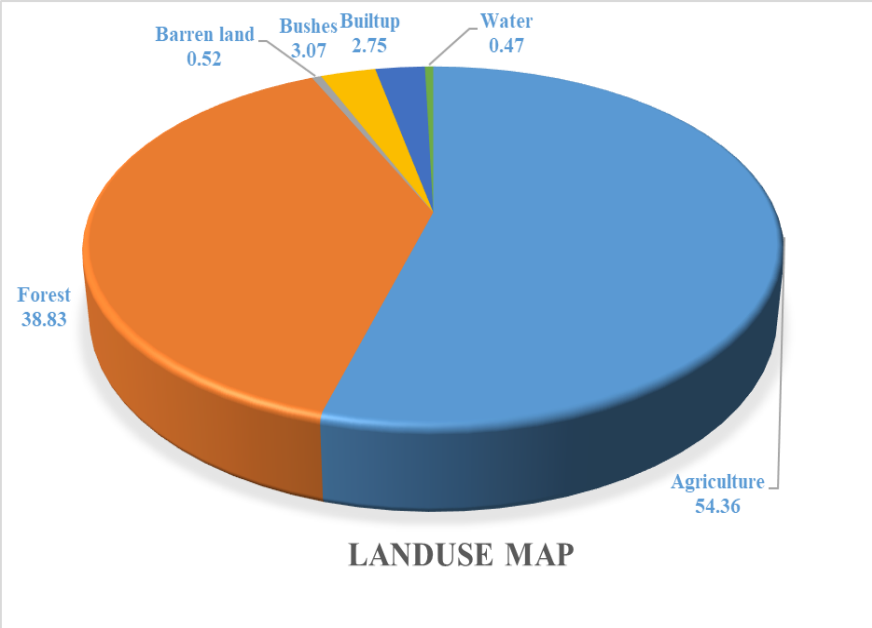
are provided with footpaths. But they are not of standard size and not maintained properly in the long run.

These few footpaths are all inadequate for disabled access. To deal with this problem, the technical section of the municipality should reqire the road designers and contractors to follow standard DoR guidelines at the time of designing and constructing the road within the municipality.

Furthermore, the bazar areas should be formally designated as 'pedestrian priority' areas, with only delivery vehicles allowed. This should be reinforced with speed limits (20 km/hour) and road design that reflects pedestrian prioritisation (ie. Paving, signage, speed humps). Communal car parking areas should be located adjacent to (outside) bazar areas.

3.5 Land use pattern

Land use pattern affects transportation planning to large extent. Future development of the locality is largely dependent on the present land use pattern and possibility of development. The land use distribution of Dhulikhel Municipality shows that nearly 55% of the land area is cultivable land and nearly 39% of total area is covered by forest and negligible percentage of river and barren land area has been found.



S.No.	Area	% age
1	Forest	38.83
2	Agriculture	54.36
3	Barren land	0.52
4	Bushes	3.07
5	Builtup	2.75
6	Water	0.47
	Total	**100.00**

Most of the area on northern side is covered by forest whereas high agriculturally productive land is witnessed in southern part. Built up areas have been developed at the junction point of two SRN roads. Some areas cannot be used for any sort of purpose because of the gradient of the land (steepness) and are termed as Barren land in the map.

Landuse and transportation are interdependent. Mobility, especially in the form of motorized transport requires an increasing share of land. Long term sustainability should be considered by altering the urban structure itself. Like transportation demands that are concentrated in downtown areas can be dispersed to city sub centres which will help in relieving congestion and promoting development of a more balanced society.

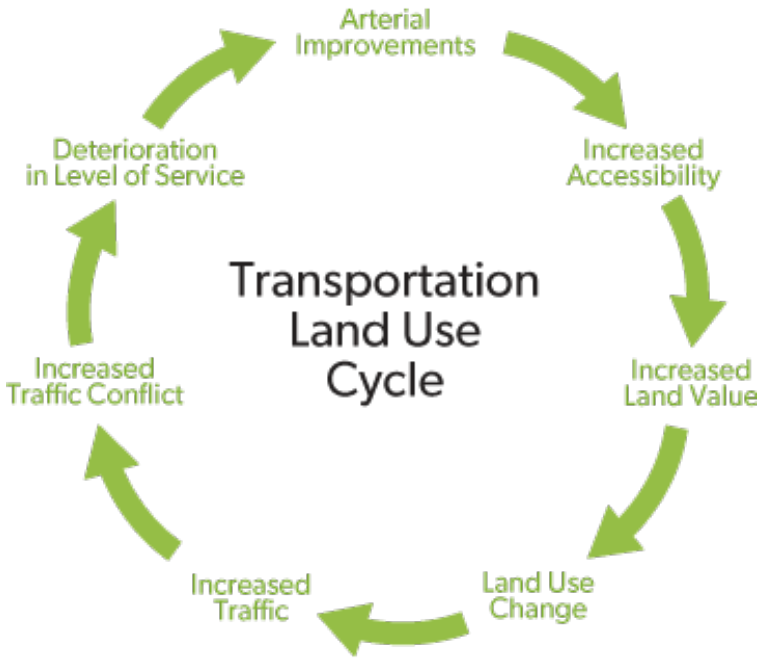


Figure 5: Land use and Transportation Cycle

CHAPTER 4: STRATEGIC LAND USE AND DEVELOPMENT PLANNING

This chapter basically deals with future projection of the population along with the allocation of future potential development areas. It also covers the formulation of hierarchy of roads with various proposed right of way for different class of roads along with relationship of future oriented land use and transportation planning. It also deals with the various infrastructure planning and how they will help to enhance the mobility and accessibility scenario. Finally, it covers the aspect of short term, Medium term and Long term transportation planning.

4.1 Population projection

Table 10: Census population figures 2001-2011

	Total Pop'n (Old 9 wards)	Total Pop'n (New 12 wards)	Households (Old 9 wards)	Households (New 12 wards)	Average Household size (Old 9 Wards)	Average Household size (12 Wards)
2001	9,812	28,826	1624	N/A	N/A	N/A
2011	14,283	32,162	3279	7061	4.36	N/A
Annual Growth rate	4.57%	1.16%				

The population growth rate of Dhulikhel Municipality (which includes both rural and urban areas) is very low compared to urban annual population growth rates in some urban centres in Nepal of up to 7 percent (World Bank, 2013). Under a 'Business As Usual' scenario, and uninterrupted by any external factors, the population of the entire Municipality is expected to be around 40,560 in 2031.

It is expected that in the rural parts of the municipality, the 1.16% annual rate will remain or in some cases may reduce due to migration/attraction to urban areas for employment or resettlement from areas of high risk of disaster.

On the other hand, it is expected that the growth rate of the existing urban areas (4,5,6 and 7) will continue to increase, at least based on the past average of 4.57%. In this context, it is expected by 2038 (in 20 years) in the pre-restructure wards alone, the

population will be 49,057 (refer to Table 4). The Dhulikhel Bazar area is centre for different commercial activities, different types of health, governmental as well as other social institutions are located in Dhulikhel. This has attracted populations from the regions around Dhulikhel resulting in increase in population.

This is consistent with other scenarios throughout urban Nepal. Should significant interventions such as the introduction of new mass transport modes or new industries, which could lead to accelerated population growth, be proposed, a review of the growth rate will be required.

Alternative growth scenarios can be difficult to predict and can be dependent on international, federal or local political or investment decisions or circumstances entirely out of control of government and the private sector, such as natural disasters. Externalities including the installation of rail from Kathmandu to Dhulikhel, thus promoting Dhulikhel as a 'commuter city' of Kathmandu, could be a 'game changer' for the Municipality. This could accelerate the economic activities of Dhulikhel when coupled with industries and tourism attracting people from hinterlands. Similarly, the potential determination of the headquarters for the Province 3 in Dhulikhel, leading to relocation government institutions is another scenario. Therefore, it is suggested for annual land supply audit and overall IUDP to be reviewed every 3 years. This will take into account changing conditions leading to changing population scenarios and allow flexibility in the strategy.

Table 11: Projected 20-year population growth

Year	Projected population for the most urban wards (annual growth rate 4.57%)	Number of household	Average household per house (No. of families per house)	Average household size	Dwelling units
2011	14283	3279	1.52	4.36	2157
2018(0)	19668	4552			2994
2023(5)	24717	5721			3763
2028(10)	31062	7190			4730

2038(20)	49057	11355			7470

Table 9:Projected population and households in the 9 most urban wards over 20 years

4.2 Strategic Physical Development Plan

Volumes 2 and 3 of the IUDP present the future land use scenario of Dhulikhel Muncipality, based on an urban population increase of 4.5% over the next 20 years. The Land Use Plan identifies a Settlement Hierarchy. This is found in the next Chapter where the Physical Development Plan is discussed.

Three Urban Growth Areas are proposed (comprising approximately 28 hectares of land) and an Urban Growth Boundary is proposed, to provide a clear indication about where future urban development should be concentrated. This strategy will protect agricultural land and assist with more efficient investment in infrastructure where the need is greatest: "Critical mass" (rather than scattered, unplanned and therefore expensive infrastructure).

Other activity centres within the wards "village settlements" support the location of education, health posts and daily convenience needs, such as groceries, butchers, tailors etc.

Based on the principles of sustainability, social connection, wellbeing of community and "sense of place" the Land Use Plan considers:

***Settlement hierarchy* –** Planning for infrastructure and services according to the population and needs of each community.

The Compact city – Encouraging development of houses and commercial businesses within areas identified for urban development. The clustering of this development means that people can easily access services without travelling too far and that there is maximum use of infrastructure.

Enhancing Agricultural land – Food security is essential to the health and wellbeing of our community. Identifying the most productive agricultural land and protecting this land against further urbanization is critical.

***A Connected Municipality* -** The ease of transportation is a key factor to support residents' access to services and businesses as they move their products to markets. Location of settlements needs to be supported by safe and efficient transport links. Communication and electricity connection are also critical.

Protecting precious assets – Identifying and protecting heritage and environmental assets is critical in maintaining the "sense of place" and what makes Dhulikhel unique and different from other places.

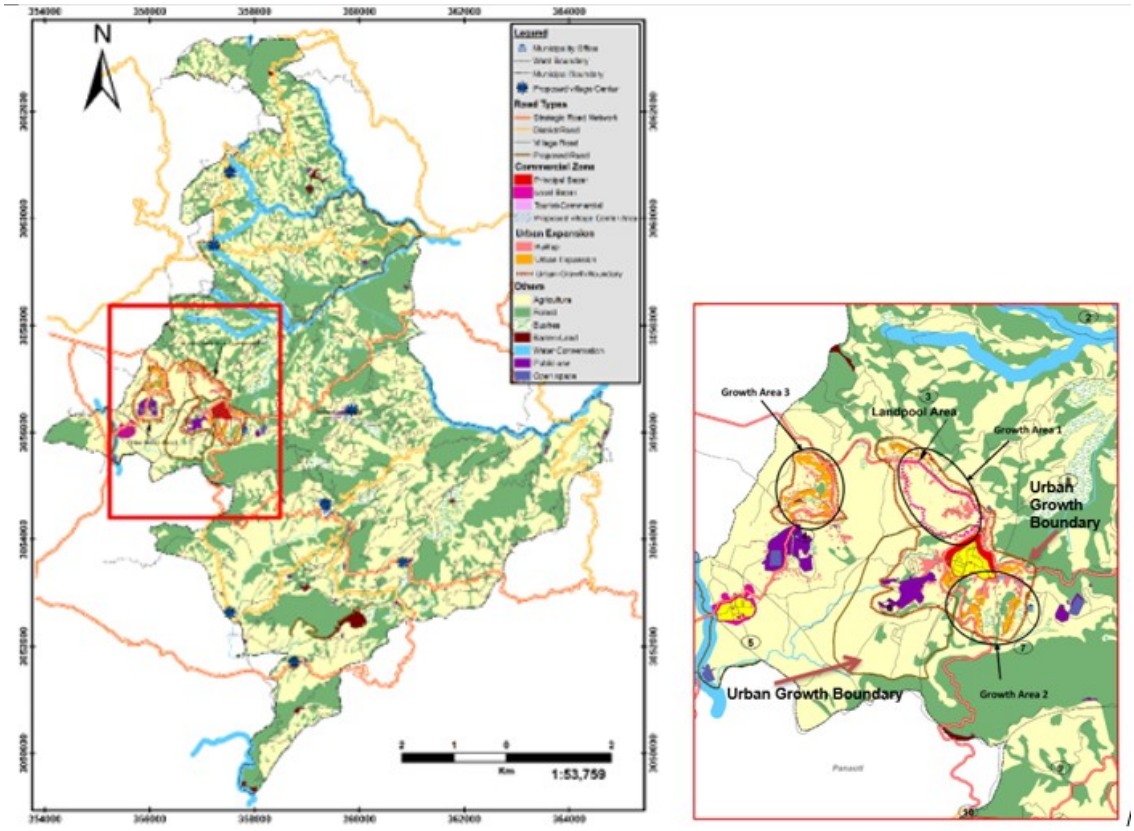


Figure 6: Land use Plan

4.2.1 Policies/Strategies

The following strategies are based on:

(a) The analysis of the existing system of human settlements and hierarchy of service centers;

(b) Disparities in the geographical distribution of service and facilities;

(c) Inter-settlement functional linkages;

(d) The distance factor in the accessibility of service centers;

(e) The Background Study Report (Volume 1) and recommendations in the Physical Development Plan (Volume 2).

1. Ensure reasonable and safe access for the entire population, to service centres;

All-weather standard road network should be improved especially in the case of access to centres of Dhulikhel and Banepa. As Rural Market centres contain or are to provide a substantial number of facilities serving basic need road access to these centres should be given emphasis in road development programs.

Land in the road reserve adjacent to Arankio and BP Highways (that land within Municipality jurisdiction) should include "active transport" corridors - pedestrian and cycling paths.

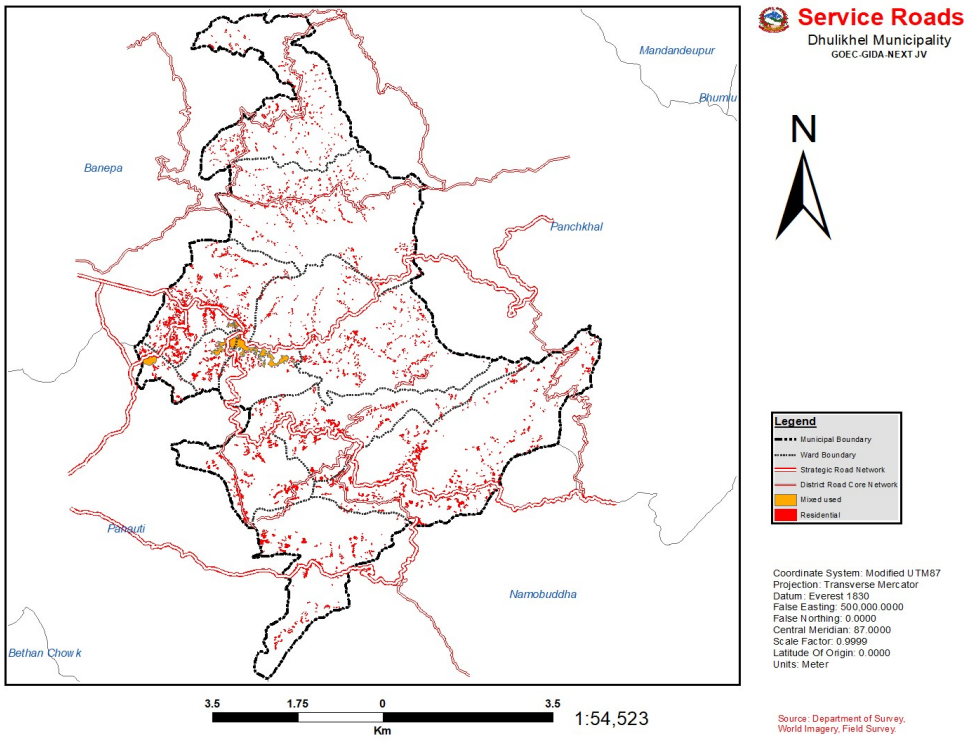


Figure 6: Service Road map (I)

Upgrading Service Roads mentioned above **(see** Figure 38**)** connecting market centres and village centres. Improvements in public transportation and increasing the frequency of public transport for **wards 2, 8, 10, 11 and 12.**

2. **Ensure accessibility from fringe areas to centres**

For the proper and most reasonable accessibility from the rural areas to the village centre, all of the existing service roads presented in the map (see Figure 8) below are to be upgraded in order to provide maximum efficiency.

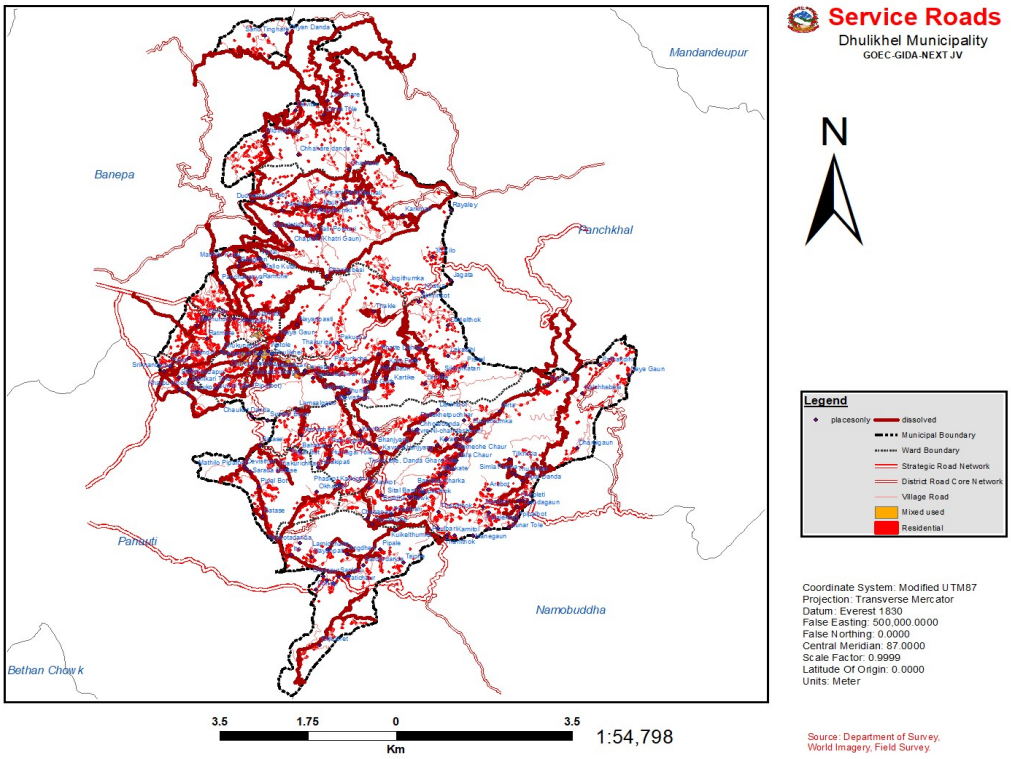


Figure 7: Service Road map (II)

3. **Achieve the greatest impact in the provision of services and facilities**;

Services should be grouped in the selected centres in accordance with the Guidelines for the Location of Services and Facilities rather than scattered in isolated places over the Dhulikhel Municipality. In this way user of one facility can benefit from other available facilities at a center during the same travel or trip and considerable travel time and cost can be saved by the relevant users.

4.3 Strategic Linkage (Connectivity) of Dhulikhel Municipality

Dhulikhel, being one of the places with great economic as well as socio-cultural value, is interlinked with a number of major highways as physical linkage like the Araniko highway which is one of the oldest highways of Nepal connecting Nepal and China, BP highway which possess a great value for connecting hills with terai and has significant economic features as well. Linkages can be of different varieties connecting and affecting the several features of a region or area. An overview table of different types of Linkages is presented below. (See Table 6)

Types of Linkages	Elements	Facilities
Physical linkages	Transport by-Road	**Networks, Intra and Inter-system Connections (Nodal Points) e.g. Interlink between Primary, Secondary and Tertiary Roads; Stations, etc.**
Economic Linkages	○ Goods Distribution ○ Production ○ Production Linkages ○ Forward and Backward ○ Linkages ○ Capital Flows	○ **Commercial Centres** ○ **Producer and Consumer Goods Markets** ○ **Input Delivery (Raw Materials, intermediate Goods, Machinery, Tools)** ○ **Export Outlets** ○ **import Agencies** ○ **Banking**
Technological Linkages	Diffusion of Technology: Skills, Machinery, Tools	○ **Production Input Delivery (see also Economic Linkages)** ○ **Vocational Training (see also Service Delivery Linkages)** ○ **Extension Services (Agriculture. Crafts)**
Service Delivery Linkages	○ **Social Services** ○ **Communication Services** ○ **Technical Services**	○ **Health Facilities** ○ **Educational Facilities (General Education, Vocational Training)** ○ **Postal Services** ○ **Telecommunication Facilities Mass Media (Newspaper, Radio)** ○ **Transportation Services (Public and Private Transportation of Passengers and Goods)** ○ **Accommodation Facilities** ○ **Maintenance/ Repair Workshops** ○ **Extension Services (Agriculture. Crafts, Industry, Trading)** ○ **Energy Supply** ○ **Water Supply, Public Utilities**

Table 10: General forms of Linkages

4.3.1 Inter-linkages

Inter-linkages are those features which deal with the open system among the group. In case of Dhulikhel municipality, a generalized Inter-linkage descriptive map showing different classes of highways or physical inter-linkage from Dhulikhel along with a brief description which helps in categorizing the various areas present along the periphery of Dhulikhel municipality is presented below**.**

Physical Inter-linkage:

1. Panchkhal ----Dhulikhel (ward 1, 2) ----Banepa through **DRCN12 AND DRCN9**
2. Kathmandu----Dhulikhel (major market clusters) ----China-**Araniko highway**.
3. Kathmandu----Dhulikhel----Bardibas-**BP highway**

4. Panauti----Dhulikhel (ward no 12) ----Namobuddha-**F72**

This linkage proves that major service centers (market centers) for the Dhulikhel Municipality are Dhulikhel bazar, Banepa Bazar and Panauti Bazar. Some important physical inter-linkages as described in the above segment is presented as a visual re-conformation in the form of a map. (See Figure X)

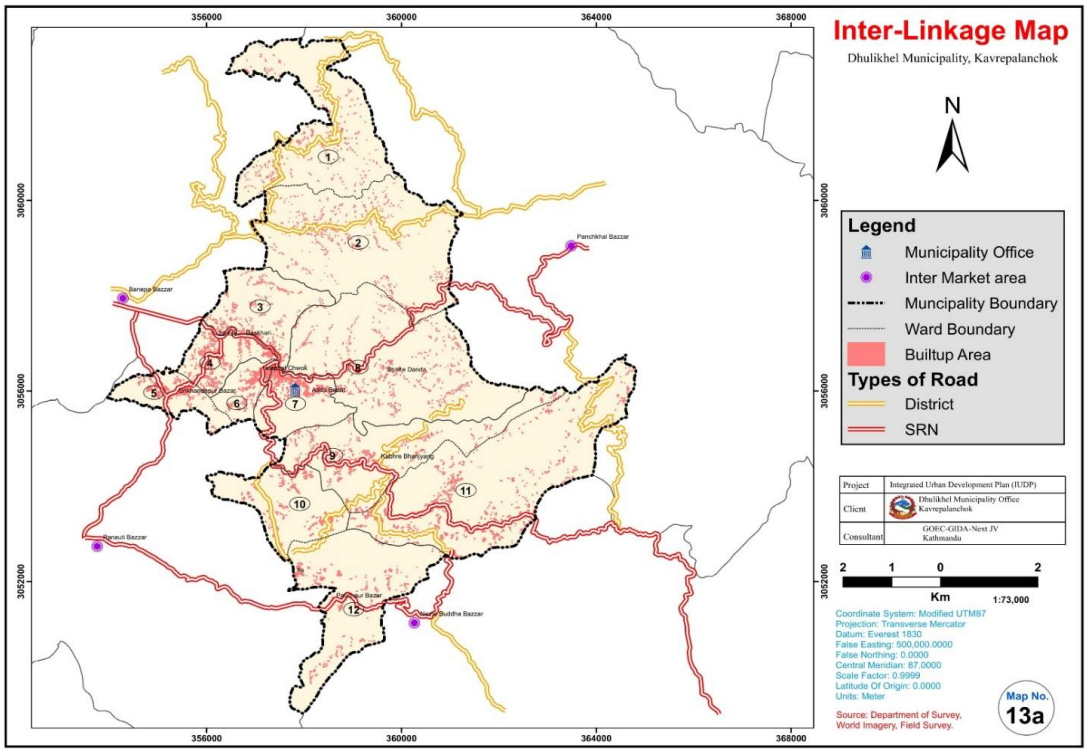


Figure 8: Inter-Linkage map

4.3.2 Intra-linkage

'Intra' is a prefix used to form words that mean on the inside, within. Therefore, Intra-linkage can be defined as the closed system of linkages within an area i.e., in this case Dhulikhel municipality. A specific example of physical intra-linkage can be a highway system or road system only within the borders of Dhulikhel municipality. A map (see Figure X) presenting different inter as well as intra-linkages of Dhulikhel municipality is given below. It shows all these possible physical inter and intra-linkages prevailing in Dhulikhel municipality.

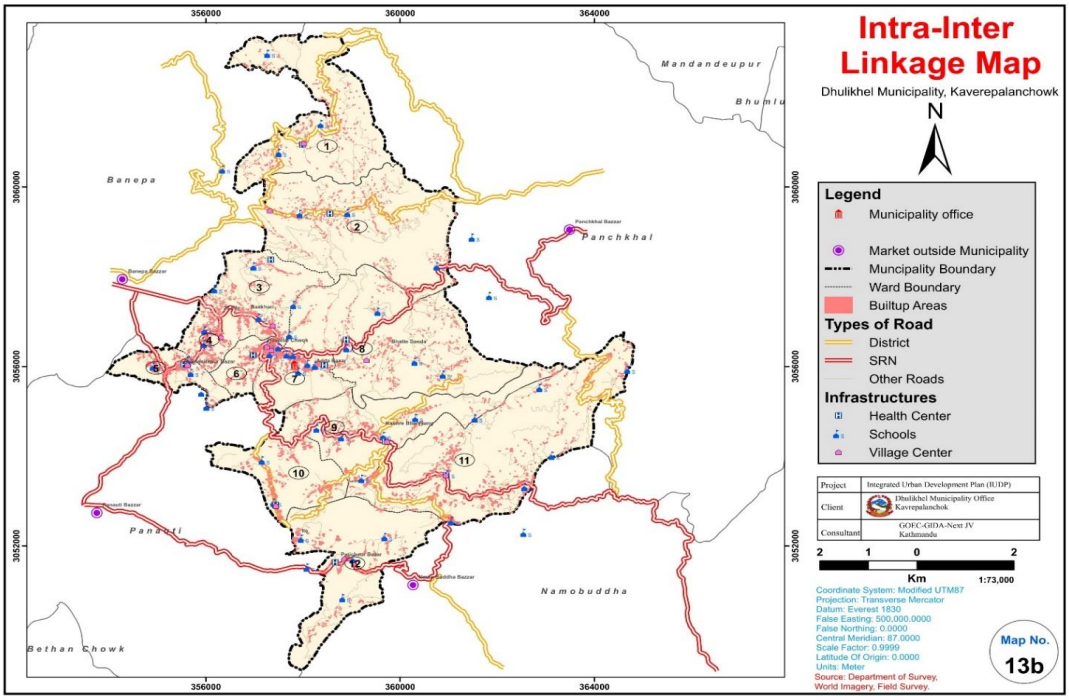


Figure 9: Intra-Inter Linkage map

It is necessary to improve links between village centres and market centres. This ensures the proper distribution of resources available locally and boosts the capability of the region both economically and institutionally. Some of the physical inter-linkages (highway and road systems) are proposed in the form of a table. (See Table X).

Ward no. Village centres	SERVICE ROADS (FRINGE SETTLEMENTS-VILLAGE CENTRE/HIGHWAYS/DISTRICT ROADS)
1 (Midinichhap)	Thing khola- Kashi Bhanjyang, Milanchowk –Bhadaure Danda – Anaikot
2 (Dudamukh)	Rabi-Deurali-Chamare, Chisapani –Sakhin Chaur, Chaplati - Ward No 1, Sisne Khola–Thini Gaun
3 (Dhulikhel bazaar)	Dhulikhel-Devitar, Panchakanya - Kutal – Rabi, Panchakanya – Chankubesi
4 (Ratmate)	Chukunepati – Bashghari, Dhulikhel - DMI – Shreekhandapur
5 (Shreekhandapur Bazar)	Punyamata Khola Corridor, GandivChok – Chaukot,
8 (Bhattedanda)	Khawa - Sikharkatarito – Kalche, Khawa - Swarsatima – Kavre bhyanjang, Thakle– Chapaladevi, Pipalbot – Kavre bhyanjang,
9 (Kavrebhanjyang)	Ghat Khola- Thulachaur, Hulaki Pati-Panitanki, DevisthanKavrebhanjyang, Kavreybhyanjang – Thatithok, Majuwa Khola – Kavreybhyanjang
10 (Batase)	Bhairabghat – Thakurichhap, Phaskot - KrisnaMandir, MathilloPipalbot - Dhungeban

11 (Kharka)	SunarTole – Tinpiple, Maskate - Thulitar – Pipalthumki, Jukepokheri – Dobane
12 (Shankhupatichaur)	Sankheswari – Tallo Eklekhet, Eklekhet – Fending, Ite – Piple, Lamichane – Kukel thumka

Table 11: Physical Intra-Linkages

4.4 Bus Park

Transportation infrastructure like bus stops and car parks are a major infrastructure for any city. The **bus park** is a compound that functions as bus storage facilities. They provide minimal facilities where the long distance buses come and wait. This is the starting and end point for longer distance buses.

There are existing two bus parks in the municipality, though one is not function able. Old bus park lies in ward no. 4 and new bus park lies in ward no 7, besides the Araniko Highway. Though the area separated for new buspark is not sufficient. No amenities and facilities required for buspark have been managed. No Ticket counters are visible. Upgradation and Maintenance of buspark is necessary.

As the buspark lies besides the Araniko highway, the location can be considered good as the arriving and departing vehicles doesnt need to enter any other roads of municipality except highway. On one hand, it has created a lesser chance of traffic congestion in the municipality. While on the other hand, it has created the vulnerability of accidents as the drivers use highway to move and turn the vehicles in buspark due to its narrow space.

4.5 Accessibility and Mobility Vision

Transportation system most often needs to trade-off between accessibility and mobility. Need of travel is a derived demand, not being end in itself but a means. Accessibility is the ease with which goods, services, people and opportunities can be reached. In the context of newly formed municipalities with core market centers as epicenter of all goods, services and facilities, people lying on the peripheral region need accessibility. Mobility is efficient movement of goods and people. Mobility is more focused on trips and distance covered. Mobility values transportation as end rather than means, but still in outlying areas accessibility require a lot of mobility, while central population need smaller trip lengths. While we provide space for active mode users and public transits as a means of enhancing

accessibility, we are trading a part of road space from the mobility sector, and when we provide more road space for private vehicles to move efficiently we trade part of road space associated with accessibility.

As population is expected to increase rapidly, there will certainly increase in economic size and have better income scenario. This will inspire people to buy private vehicles of their own to increase mobility, requiring greater road space width which will be provisioned by class A and class B roads but the aim of sustainable transport and accessibility policy will be to check private ownership of vehicles under control.

Present scenario of access of roads from settlement is little more, which needs to be reduce for better access. Similarly, the time taken to reach the bus stop is also slightly high, which need to be reduced for better mobility. Class "C" roads that serve dual functions of access as well as mobility are designed in such a way that people do not need to travel more than more than 5 minutes to get to a bus stop. People will have access on either Class "B" or Class "A" roads designed for mobility within 10 minutes or 20 minutes on an average walking distance that are designed for greater mobility. Planning work has focused on reducing access directly to highways, subsequent developments are recommended for national authority to develop required infrastructures.

MTMP has identified and mapped all the roads and other infrastructures of the Municipality. With the proposed road network and road infrastructures, the mobility will be enhanced resulting in safe, comfortable and efficient movement of goods and people. The visionary development plan along with MTMP will support the growth of the lead sectors of the Municipality. During this period, the population of Municipality will also be increased and hence the demand of wider road will also be justified. Thus, the desired level (full phase construction) during this time period. This will help flourish the local markets. A well-connected road network within the Municipality, the adjoining municipalities and VDCs will be benefited. Proposed cycle tracks and pedestrian way will facilitate and majority road users. The facilities and well-connected road network will facilitate safe and efficient trips. Increased trips will bolster the economy of the Municipality. Complete road network with systematic and reliable public transportation helps to fulfil the people demand and hence facilitate in the achievement of vision of Dhulikhel Municipality of developing as the agricultural area.

CHAPTER 5: ROAD HIERARCHY DEVELOPMENT

4.3 Formulation of road hierarchy

Roadways serve a variety of functions, including but not limited to the provision of direct access to properties, pedestrian and bicycle paths, bus routes and catering for through traffic that is not related to immediate land uses. Many roads serve more than one function and to varying degrees, but it is clear that the mixing of incompatible functions can lead to problems. Thus it is important to distinguish 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 of that roadway can be set and appropriate design criteria can be implemented. It is an important tool of road network and land use planning to asset management.

Road hierarchy restricts or reduces direct connections between certain types of links. These hierarchical distinctions of road types become clearer, when considering the recommend design specifications for the number of through lanes, design speed, intersection spacing and driveway access.

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

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

There are different levels of hierarchy around the different parts of the world. Some different classification are:

- UK's Overseas Development Association (ODA) published a book on the planning and design of road works, called "Towards safer roads in developing countries" suggests 5 levels in a road hierarchy i.e. Primary distributors, District distributors, Local distributors, Access roads and Pedestrian stress.

- Road Hierarchy of Brisbane ha six level of hierarchy that includes: Motorway, Arterial route, Suburban Route, District Access, Neighbourhood Access and Local Access.
- USA's Federal Highway Administration (FHWA) defines three level of hierarchy: Arterial Collector and Local
- Indian Road Congress (IRC) has classified urban roads into four class: Arterial, Sub-arterial, Collector and Local Streets.
- NRS 2070 has classified road in four types that includes Class A, B, C and D roads based on technical/functional classification, and highlight the fact that these class are almost equivalent with expressways, arterial roads, collector roads and local roads respectively.
- NURS 2068 (Draft) has classified urban roads into five categories, i.e. Expressway, Arterial, Sub-Arterial, Collector and Local roads.

This study also formulates the road hierarchy for the various roads. After completing a literature review, this report proposes a four-level hierarchy for roads namely Class A, B, C and D. Class C and D provides local access while Class A and B provides mobility and accessibility to higher services.

Based on various literature, the recommended right of way TOR does not seem to be justifiable one as there is necessity of arterial road within the Municipality. Also, the road space needs to be distributed to all road user equally with provision of green belt, cycle track thus there need to be a provision for green belt cycle track and footpath. After a proper study, the ROW of 16, 12, 10 and 7m is recommended for class A, B, C and D road respectively.

Table 12: ROW based on Road Hierarchy

Type of City	Criteria	ROW based on Road Hierarchy (m)			
		Arterial	Sub arterial	Collector	Local
Sub city	10,000-40,000	-	30	20	10
City	40,000- 100,000	50	30	20	10
Sub Metro City	100,000-300,000	30	20	10	10
Ref: Planning Norms and Standard 2015, GoN, DUDBC					

ROW based on Road Hierarchy (m)				
Expressway	Arterial	Sub arterial	Collector	Local
-	50-60	30-40	20-30	10-20
Ref: Nepal Urban Road Standard 2068 (draft)				

Standard	Cycle Track	Median Strip
NURS 2068 draft	2 m on both side	3 m
NRS 2070	2 m on both side	3 m

During the preparation of the MTMP, the issue of road width attracted a lot of debate in the discussion hall. The main issue was the potential social, economic and emotional loss of requiring existing roads to be made wider, in particular where land will need to be acquired to widen the roads. As these decisions were to be made by the limited group of political leaders and technicians, they felt such matters should go to the public prior to making the decision.

Considering such comments, only the class of roads was first introduced to the people followed by the network of roads of class A and B proposed. After agreement on the road networks, the proposed right of way was introduced and discussed. The heat due to the proposed right of way was addressed by illustrating the examples of the developed cities where, with growing economies, roads were widened with huge loss of property. All the participants had a common consensus on the necessity of the proposed road cross section with interconnected sidewalks and cycle tracks along with green belt.

So, the main problem under question was on how the social, economic and emotional impact of the individuals whose land/house is located alongside the proposed expansion of roads can be preserved. To address this question, different tools were presented such as monetary compensation of the asset to be acquisitioned which will preserve the economic loss, while social and emotional loss may not be addressed. Similarly, land pooling tool can be applied to the class A and B roads so that all three types of losses can be minimized. The political party representatives and other representatives agreed on the necessity of the proposed infrastructure and ROW, and the network of class A and class B roads for smooth and rapid development of the local economy. They highlighted their concern on the compensation of land necessary for road.

That said, in the areas which are highly urbanised, the strategy of prioritising pedestrians and restricting vehicles through upgrading road surfaces and drainage but maintainaing narrow roads, slow speed controls and other design interventions such as landscaping will avoid the need to these widen local roads.

Table 13: Comparison of Classes of roads based on various criteria

Criteria	Class A	Class B	Class C	Class D
Purpose	Mobility	Mobility and control access	Access and mobility	Access
Function	Through and long-distance movement	Connect Class A and C: Provide alternative connection routes between Class A	Connects higher order roads and mobility to local trips	Connect local trips to higher level roads.
	High Network Coverage	Support Through Movement of Traffic	Access to property	Direct access to property
	Segregated NMT facilities and Bus laybys	Segregated NMT facilities and Bus laybys	Segregated NMT facilities	Local NMT movement
Maintenance Responsibility	Municipality	Municipality	Municipality and Community	Community
Design Speed (kmph)	40	30	30	20
Radius (m)	30	20	15	15
Minimum RoW (m)	16	12	10	7
Extra Width at curve (m)	2	1.5	1	1
Setback Distance (m)	1.5	1.5	1.5	1.5
Access Control	Applicable	Not Applicable	Not Applicable	Not Applicable
Public transport Service	Mass Transit facilities	Mass Transit, Local Public Transport	No public Transportation	No public Transportation

5.1 Road Hierarchy

Road network serves access to various land uses 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 so 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.

There are restrictions of direct linkage between various kinds of road-hierarchy. In other words, direct connections between certain types of road links should are 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 Figure 8, these hierarchical distinctions of road types becomes clearer when considering 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 uses and activities that are incompatible with traffic flow are restricted from routes where traffic movement should predominate.

Figure 10: Road Network Hierarchy

5.2 Formulation of Road Hierarchy

Roads under the jurisdiction of the Municipal authority are referred as urban roads. The classification practices of urban roads are guided by the functional hierarchy of roads. The Municipality has a complete road network hierarchy consisting of of all four classes; National Highways, Feeder Roads, District Roads and Urban Roads.

The concept of road hierarchy assists in planning the overall road network and its transport services. Different classes of road have different effects on surrounding areas and other roadways. The hierarchy 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. The 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.

Table 14: Proposed width for various types of roads within urban area:

City	Criteria	Expressway	Arterial	Sub arterial	Collector	Local
Sub city	10,000 -40,000	-	-	30m	20m	10m
City	40,000 -100,000	-	50m	30m	20m	10m
Sub Metro City	100,000 -300,000	50m	30m	20m	10m	10m

Source: Planning Norms and Standard 2015, GoN, DUDBC

Table 15: Standard norms for different cross section

Standard	Cycle Track	Footpath	Median Strip
NURS 2068 draft	2 m on both side	2 m on both side	3 m
NRS 2070	1.2 m on both side	1.5 m on both side	3 m

These standards are based on interaction with local, MRCC members as well as the Municipality during various stages of the MTMP process and on the basis of ToR, following right of way (RoW) had been recommended.

Table 16: Classification of Municipal Roads

Road Type	Road Class	Minimum Recommended Right of way
Main Collector Road	Class A	16 m
Other Collector Road	Class B	12 m
Tole Road	Class C	9 m
Other Road	Class D	7 m

Various hierarchy of road have different functions and characteristics. They serve different purpose and hence there is fundamental difference between different classes of roads as highlighted in Table 11.

Table 17: Comparison of various hierarchy of roads

Criteria	Class A	Class B	Class C	Class D
Purpose	Mobility	Mobility and access	Access and mobility	Access
Function	Through and long distance movement	Connect Class A and C; provide alternative connection routes between Class A	Connects higher order roads & mobility to local trips.	Connect local trips to higher level roads.
	High network coverage	Support through movement of traffic	Access to property	direct access to property
	Segregated NMT facilities and Bus laybys	Segregated NMT facilities and Bus laybys	Local NMT movement	Local NMT movement
Maintenance Responsibility	Municipality	Municipality	Municipality & Community	Community
Design Speed (Kmph)	40	30	30	20
Radius (m)	20	15	12	15
Minimum RoW (m)	16	12	9	7
Extra width at curve (m)	1.5	1	1	1
Setback distance (m)	1.5	1.5	1.5	1.5
Access Control	Applicable	Not Applicable	Not Applicable	Not Applicable
Public transport services	Local Public Transportation	Local Public transport	No public transportation	No public transportation

Different class of roads serves different functions; some serve the function of access and others serve the function of high quality mobility. Hence formulation of Road Hierarchy is must to ensure effective and efficient transportation planning process. This study formulates four level road hierarchy namely A, B, C and D as described in above chapter. The function of class C and D is basically to provide access, while class A and B provides mobility and accessibility to higher services.

Class "A" roads connect one or more major growth centers or has direct linkage to the National Strategic Road Network or district road and thus has high network coverage. Class "B" roads connect to the major road network and other roads of similar hierarchy with either major growth center or provide access between class A and Class C roads. Class "C" roads provide connection to higher order roads or with agricultural roads which connect a farm with mini-market center or an agro based production center. Class "D" roads are all other minor roads, with width above the minimum standard of Municipality which provides access to a tole and property.

5.3 Details of Class A Roads

These roads are wider roads, basically with total right of way of **20m** and principally serve the purpose of mobility. However, in case of Dhulikhel Municipality these roads will be designed with Right of Way of **16 m**. Two Class A Roads have been proposed. These roads are high standard roads with longer length and serving large number of population and are considered as highways of the Municipality and connects one or more major growth centers or has direct linkage to SRN or LRN and thus has high network coverage. The Design Speed of 40 Kmph has been set for Class A roads.

These roads are equipped with proper facilities for vehicles, pedestrians, cyclists and green belt. After proper study of present condition and future possibility and consultation with MRCC and municipality, the proposed Class A roads are shown in following table:

Table 18: List of Class A Roads

S. No.	Municipality Code	NAME	Length (Km)	Ward Passed	Inter-vention
1	24M02A001	Chahare Khola - Dhulikhel Khola ko Pakha	6.46	1, 2	New
2	24M02A002	Punyamata Khola Corridor	1.75	5	New

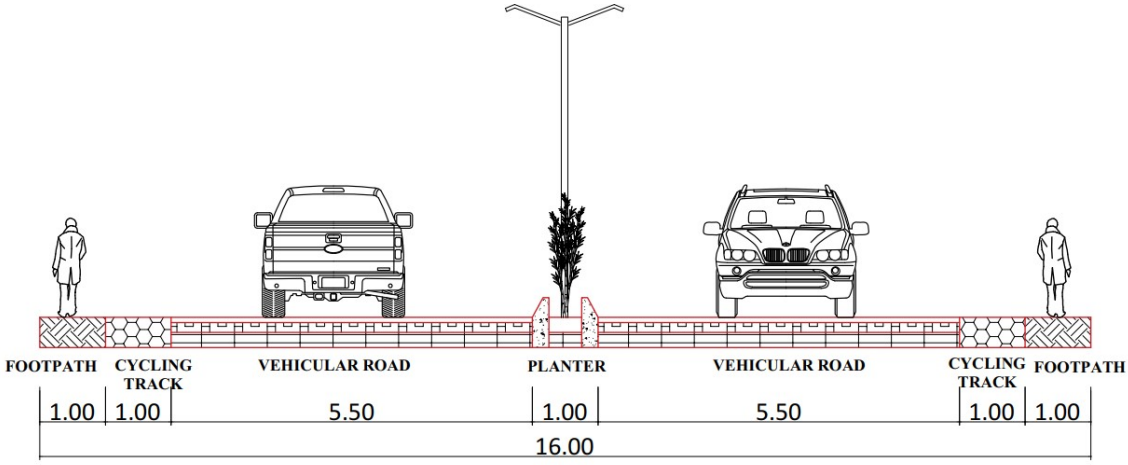


Figure 11: Class A Road

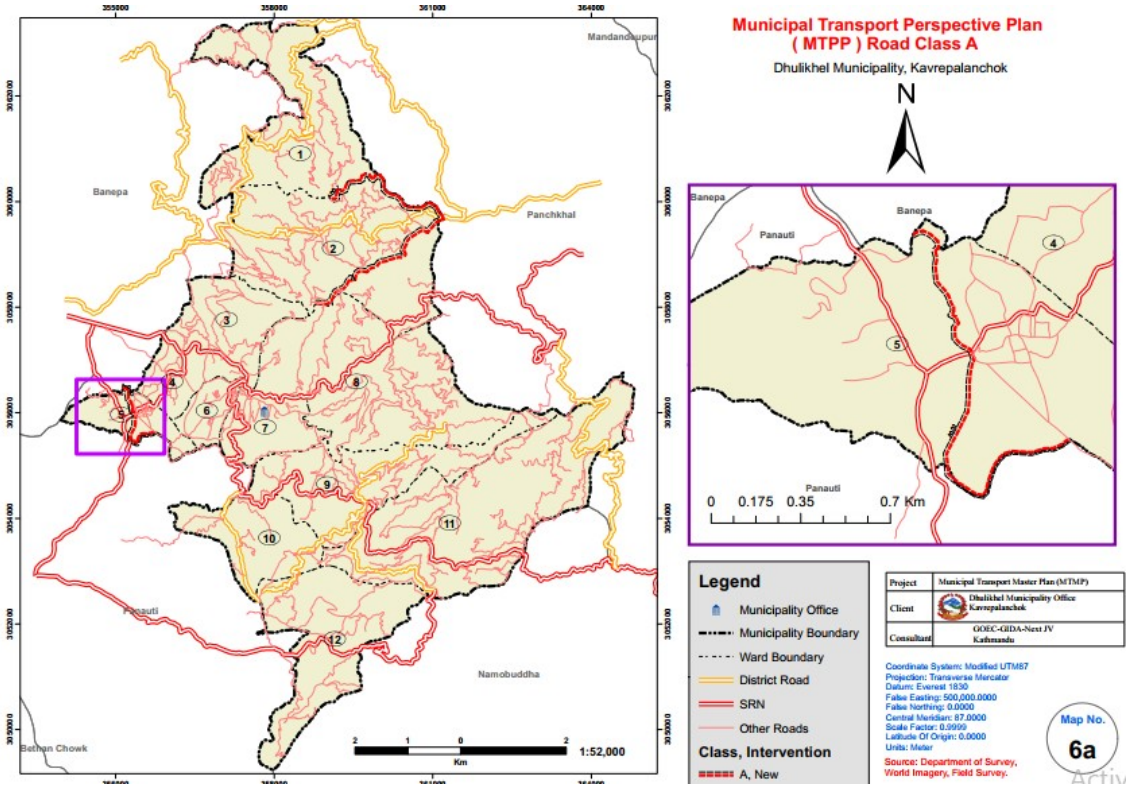


Figure 12: Map showing Class A Roads

5.4 Details of Class B Roads

These roads will be designed with total right of way of **12 m** and can be considered as Feeder roads of Municipality. **Nine (9)** Class B Roads have been proposed. These roads connect major road network and other roads of similar hierarchy with either major growth center or provide access between Class A and Class C road. Mobility is also the main function and purpose for these roads too and are designed with similar facilities for all road users including includes drivers, pedestrians and cyclists. The Design Speed of 30 Kmph has been set for Class B roads.

After a study of present conditions and future possibility and consultation with MRCC and the Municipality, the proposed Class B roads are shown in following table:

Table 19: List of Class B Roads

S.N	Municipal Code	Name	Length (Km)	Ward Pass	Existing Width	Intervention	Surface
1	24M02B001	RTO Road Chaukot	2.72	5,6,7	12	Upgrade	Gravel
2	24M02B002	Biscute Factory – Hulak	0.33	5	9	Upgrade	Gravel
3	24M02B003	Lamichane – Kukelthumka	2.66	12	0	New	New
4	24M02B004	Devisthan - Dhulikhel picnic spot /	0.49	7	11	Upgrade	Bitumen
5	24M02B005	Bataasey BP highway - Bhattedaada	2.28	7,10	11	Upgrade	Earthen
6	24M02B006	Kaabre bhanjyang/Devisthan(old road) - Sukkha Pokhari	0.78	9	11	Upgrade	Earthen
7	24M02B007	Kaabre bhanjyang/Devisthan(old road)- Dhulikhel	1.18	9	11	Upgrade	Earthen
8	24M02B008	Laakuri bhanjyang- BP highway	0.21	9	10	Upgrade	Earthen
9	24M02B009	Hospital maarga	0.65	6	11	Upgrade	Bitumen

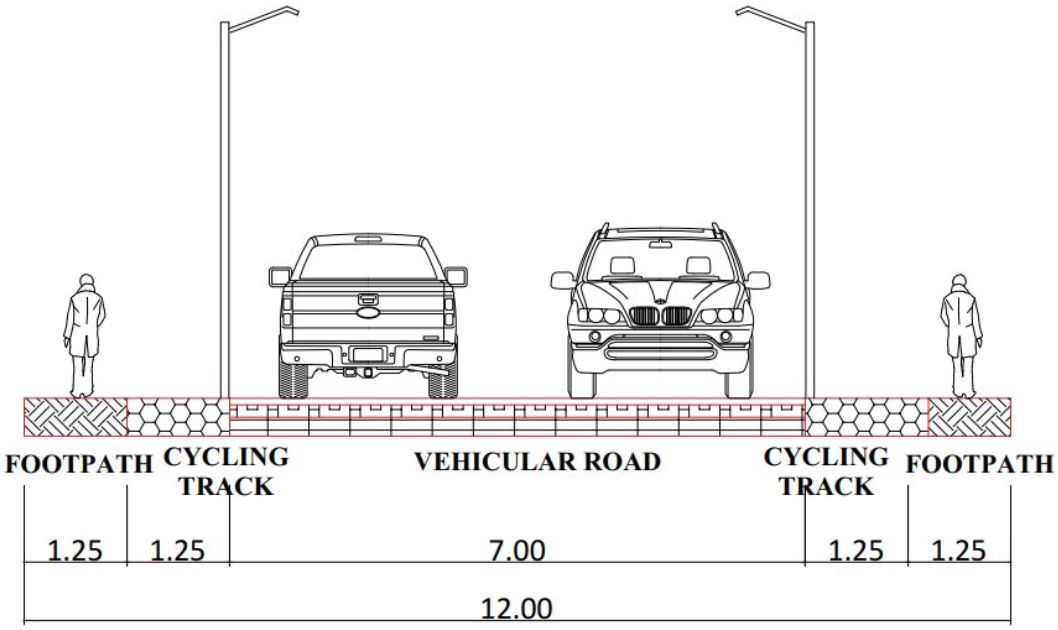


Figure 13: Class B Road

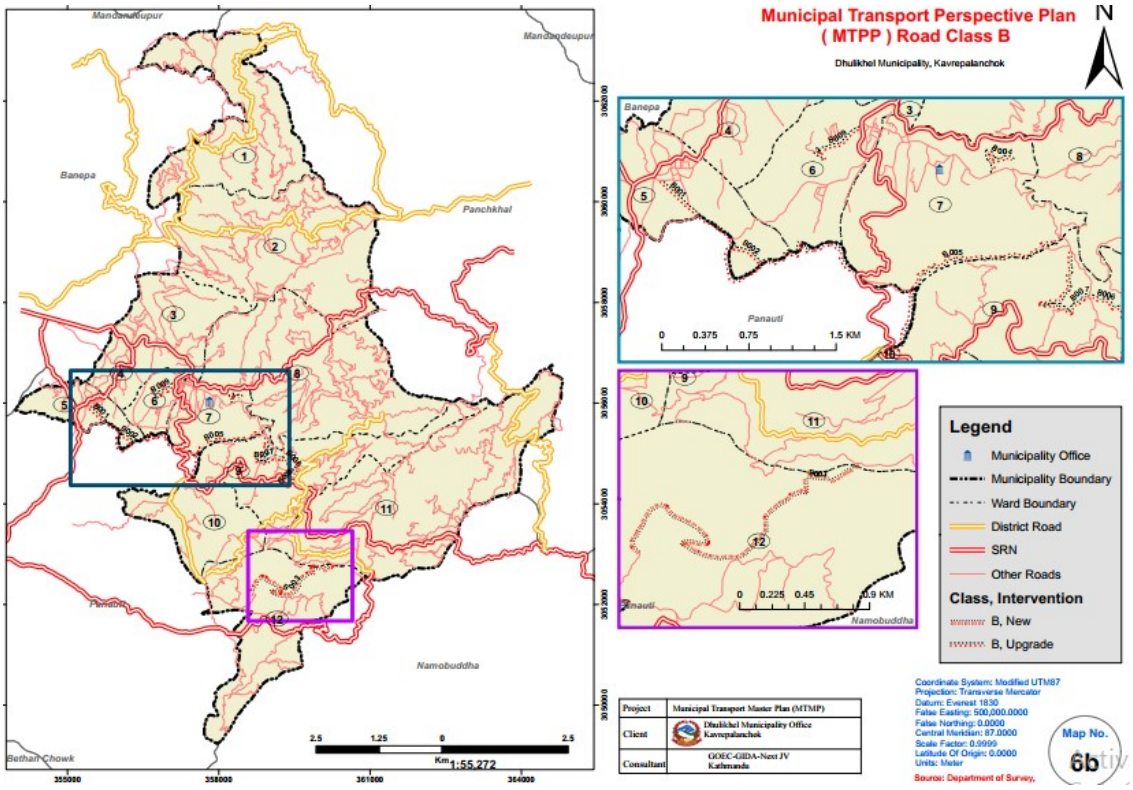


Figure 14: Map Showing Class B Roads

5.5 Details of Class C Roads

The primary function Class C Roads is access and secondary function is mobility and provide access to class D roads. These roads connect to higher order roads or, in the case of agricultural roads, connect a farm with a mini-market center or an agro-based production center. These roads are equipped with proper facilities for vehicles, pedestrians, cyclist and greenbelt. During the preparation of the MTMP the team faced great difficulty in fixing the right of way (ROW) of Class C roads however the **ROW of 9 m** has been fixed. **84** Class C roads have been proposed. A Design Speed of 30 Kmph has been set for Class C roads.

Table 20: List of Class C Roads

SN	Municipal Code	NAME	Length (Km)	Ward Pass	Inter vention	Existing width	Surface
1	24M02C001	Ting Khola - Kashi Bhyanjang	5.91	1	Upgrade	9	Earthen
2	24M02C002	Milan Chok - Bhadaure Danda – Anaikot	4.85	1	Upgrade	9	Earthen
3	24M02C003	Sano Tinghare road	2.80	1	Upgrade	9	Earthen
4	24M02C004	<Null>	3.19	1	Upgrade	9	Earthen
5	24M02C005	Chamare to 24DR012	2.04	1	Upgrade	9	Earthen
6	24M02C006	School Danda -Ting Khola/Kashi Bhyanjang Road (School Danda - Chyaan Danda)	1.01	1	Upgrade	9	Earthen
7	24M02C007	Ting Khola/Kashi Bhyanjang - Chyaan Danda (School Danda - Chyaan Danda)	1.51	1	Upgrade	9	Earthen
8	24M02C008	<Null>	1.62	1	Upgrade	9	Earthen
9	24M02C009	<Null>	1.45	1	Upgrade	9	Earthen
10	24M02C010	Lamatole to Devitar	0.85	1	Upgrade	9	Earthen
11	24M02C011	Chyaan danda road	0.59	1	Upgrade	9	Earthen
12	24M02C012	Chhahare danda road	0.57	1	Upgrade	9	Earthen
13	24M02C013	<Null>	0.56	1	Upgrade	9	Earthen
14	24M02C014	Pakucha - Domane (MTMP), Pakuchaa maarga	4.15	2,8	Upgrade	9	Earthen
15	24M02C015	Thakuri Guan Marga	3.20	2,8	Upgrade	9	Earthen
16	24M02C016	Chaplati – Chamare	2.62	2	Upgrade	9	Earthen
17	24M02C017	Chaplati - Ward No 1	1.94	3	Upgrade	9	Earthen
18	24M02C018	Rabi - Deurali – Chamare	4.34	2,3	Upgrade	9	Earthen
19	24M02C019	Sisne Khola - Thini Gaun	0.73	3	Upgrade	9	Earthen
20	24M02C020	Naya Basti maarga /Bhandari gaaun maarga (Panchakanya - Chankubesi MTMP)	3.18	3,8	Upgrade	9	Earthen

21	24M02C021	Dhulikhal - Nagarkot (MTMP), Bajrayogini maarga	2.64	3	Upgrade	9	Earthen
22	24M02C022	Thaa daada maarga (Panchakanya - Kutal - Rabi -Chaplati - Chamare MTMP)	4.14	2,3	Upgrade	9	Earthen
23	24M02C023	Taasi chhabeyling maarga (Nayagaun Bato MTMP)	1.62	3,8	Upgrade	9	Earthen
24	24M02C024	Kuttal maarga (Dhulikhel-Devitar MTMP)	3.55	2,3	Upgrade	9	Gravel
25	24M02C025	Kuttal maarga	0.93	3	Upgrade	9	Earthen
26	24M02C026	Gorakhnaath Marga	0.29	4	Upgrade	9	Bitumen
27	24M02C027	Pipal bot Marga	0.23	3	Upgrade	9	Bitumen
28	24M02C028	Navadurga maarga,Sohrakhuttey Maarga,tahagaaal maarga,Bhoomioath maarga (Dhulikhel -Gitamarg Hospital Chok - Takhusi-DMI - Shreekhandapur MTMP)	1.76	4,6	Upgrade	9	Bitumen
29	24M02C029	Agoharibaba Marga	1.59	4	Upgrade	9	Gravel
30	24M02C030	Pancha kumari Marga (Chukunepati - Bashghari MTMP)	0.62	4	Upgrade	9	Gravel
31	24M02C031	Bukhhundol maarga ,Shreekhandapur - F07301 (Shreekhandapur - 28 Kilo MTMP)	0.61	4	Upgrade	9	Gravel
32	24M02C032	Purkutitole - Muktimarga – Chaukot	0.44	4,5	Upgrade	9	Gravel
33	24M02C033	Bhoomipath maarga	0.40	4	Upgrade	9	Bitumen
34	24M02C034	Bukhhundol maarga	0.71	4	Upgrade	9	Bitumen
35	24M02C035	Nava shaanti maarga	0.23	4	Upgrade	9	Bitumen
36	24M02C036	Chaukot maarga (Lankhanamai Mandir - Suwaltole MTMP)	1.57	6	Upgrade	9	Bitumen
37	24M02C037	Laayakoo Maarga (Punyamata Chowk - Thapaliya Chowk MTMP)	0.48	5	Upgrade	9	Gravel
38	24M02C038	Lasangu Maarga	0.28	5	Upgrade	9	Bitumen
39	24M02C039	Bhairav maarga,Shreekhanda maarga	0.81	5	Upgrade	9	Gravel
40	24M02C040	Punyamaata marga; (BP HW - Prakeshlibrary MTMP)	0.25	5	Upgrade	9	Gravel
41	24M02C041	Mukti maarga (Lakhana Mai Mandir-RTO- Mukti Marga MTMP)	0.50	6,7	Upgrade	9	Gravel

42	24M02C042	Geeta maarga (Dhulikhel - Gitamarg Hospital Chok - Takhusi- DMI - Shreekhandapur MTMP)	0.34	6	Upgrade	9	Bitumen
43	24M02C043	Baalkumari maarga (Lankhanamai Mandir - Suwaltole MTMP)	0.21	6,7	Upgrade	9	Bitumen
44	24M02C044	Ganesh maarga	0.31	6	Upgrade	9	Bitumen
45	24M02C045	Ganesh maarga-Sindhuli Marga	0.15	6	Upgrade	9	Bitumen
46	24M02C046	Siddha pokhari marga	0.10	6,7	Upgrade	9	Bitumen
47	24M02C047	Dutol maarga	0.10	6	Upgrade	9	Bitumen
48	24M02C048	Kaabre bhanjyang - Devisthan(old road), (Devisthan - Kavrebhanjyang MTMP)	1.77	7,9	Upgrade	9	Earthen
49	24M02C049	Devisthan - Golden Buddha-Sanjibani bazar - Dhulikhel Campus - Adda Bazzar-Swarsati Bazar	2.28	7	Upgrade	9	Bitumen
50	24M02C050	Soopari taar Nagarpalika marga (Sanjabani school - Nagarpalika - Mainroad MTMP)	0.70	7	Upgrade	9	Bitumen
51	24M02C051	Hoorkha Marga (Swarsati Bazar - Hurkhamarg - BP MTMP)	0.62	7	Upgrade	9	Gravel
52	24M02C052	Gutuchha Marga (Dhulikhel Bus stop-Swarsati Bazar - Gutuchhamarga - BP HW MTMP)	0.62	7	Upgrade	9	Gravel
53	24M02C053	Eemaathey	0.53	7	Upgrade	9	Bitumen
54	24M02C054	Hoorkha Marga (Swarsarsati Bazar - Thado Orolo - BP HW MTMP)	0.33	7	Upgrade	9	Gravel
55	24M02C055	Dhobhi khola-Lamsal gaau-Namo buddha sadak	0.26	7,9	Upgrade	9	Earthen
56	24M02C056	Ananda Maraga	0.19	7	Upgrade	9	Bitumen
57	24M02C057	Bagaichaa maarga (Khawa - Sikharkatari - Kalche MTMP)	2.74	8	Upgrade	9	Earthen
58	24M02C058	Sikhar katari - Lutel Gaun	1.66	8	Upgrade	9	Earthen
59	24M02C059	Sallepani-Thulitar Road (Sikharkateri - Gangaram-Sallepani-Thulitar MTMP)	2.25	8,9	Upgrade	9	Earthen
60	24M02C060	Swargehoomen Maarga	2.16	8	Upgrade	9	Earthen
61	24M02C061	Chayyal Devi Marga (Thakle - Chapaladevi MTMP)	2.24	8	Upgrade	9	Earthen

62	24M02C062	Bhatte daada Marga (Pipalbot - Kavreybhyanjang MTMP)	3.94	7,8,9	Upgrade	9	Earthen
63	24M02C063	Raamche daada-Teen piple/Paatle khet -Teenpiple	10.09	9,11	Upgrade	9	Earthen
64	24M02C064	Paani tank-Deurali daada-Namo Buddha Road	0.60	9	Upgrade	9	Earthen
65	24M02C065	Ram Mandir to kalika devi mandir to 24DR018	1.56	10,12	Upgrade	9	Earthen
66	24M02C066	Thumka sadak - Namobuddha Lodge Danda	2.91	11,12	Upgrade	9	Earthen
67	24M02C067	Bhairabghat - Thakurichhap	1.46	10	Upgrade	9	Earthen
68	24M02C068	Eklekhet - Fending	2.39	12	Upgrade	9	Earthen
69	24M02C069	Ite - Piple	2.45	12	Upgrade	9	Earthen
70	24M02C070	Sangkhupatichaur - Shree shankheshwori pra vi Namobuddha Municipality	2.05	12	Upgrade	9	Earthen
71	24M02C071	Eklekhet to F07202 road	1.89	12	Upgrade	9	Earthen
72	24M02C072	Sankheswari - Talloeklekhet	1.89	12	Upgrade	9	Earthen
73	24M02C073	Nayanpati to Saukotadanda	1.08	12	Upgrade	9	Earthen
74	24M02C074	<Null>	1.06	12	Upgrade	9	Earthen
75	24M02C075	Eklekhet road	0.73	12	Upgrade	9	Earthen
76	24M02C076	<Null>	0.59	12	Upgrade	9	Earthen
77	24M02C077	Ite/piple road to Lamichhane gaun	0.45	12	Upgrade	9	Earthen
78	24M02C078	Sankhupati chaur to Ryale	0.45	12	Upgrade	9	Earthen
79	24M02C079	Devisthan to Panauti	2.52	10	Upgrade	9	Earthen
80	24M02C080	<Null>	0.26	12	Upgrade	9	Earthen
81	24M02C081	<Null>	0.11	12	Upgrade	9	Earthen
82	24M02C082	<Null>	0.20	1	Upgrade	9	Earthen
83	24M02C083	<Null>	0.28	1	Upgrade	9	Earthen
84	24M02C084	<Null>	0.27	1	Upgrade	9	Earthen

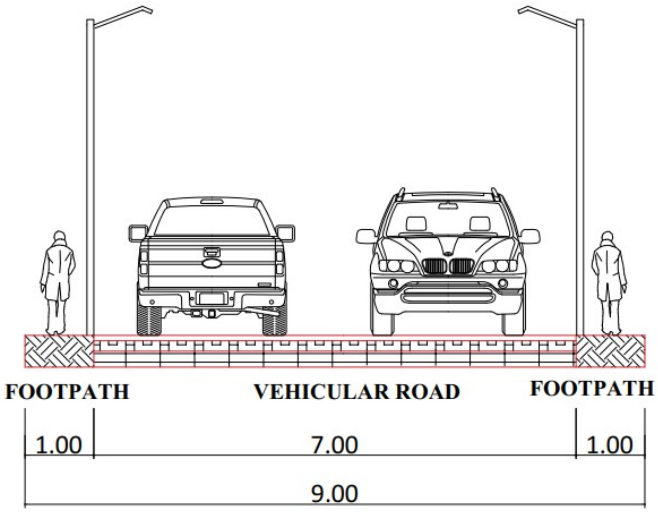


Figure 15: Class C Road (Right of way 9m)

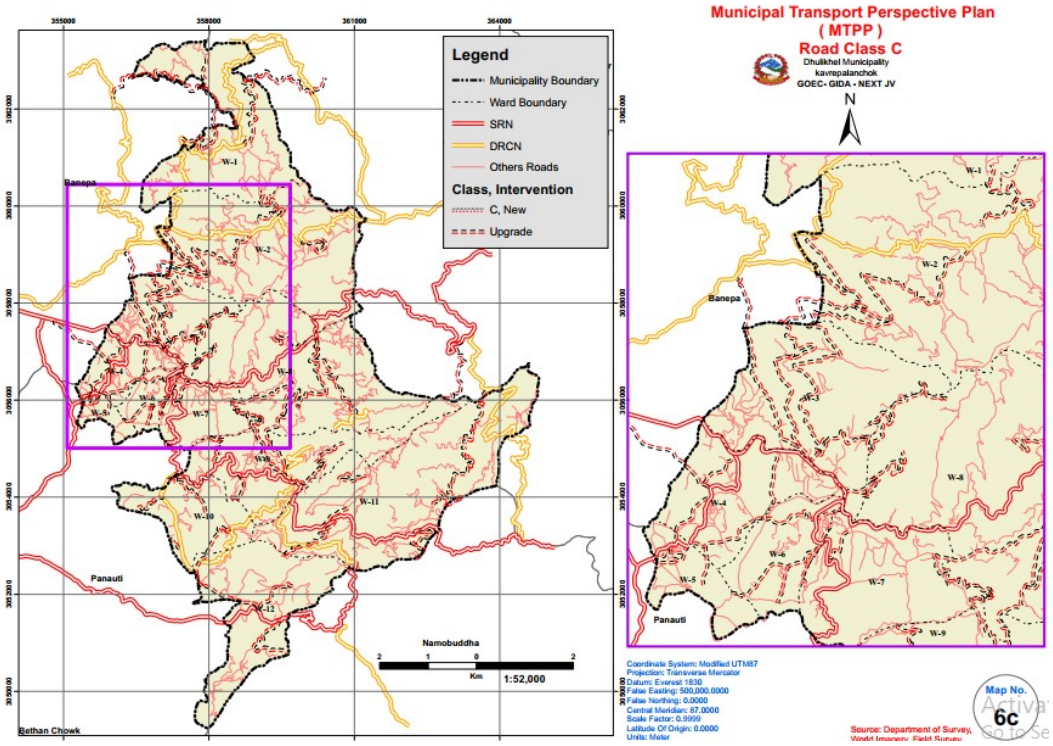


Figure 16: Map Showing Class C Roads

5.6 Class D Roads

Class D roads are all other minor roads which provide access to public property. All other roads that fulfil the minimum requirement set by the Municipality and that do fall under above classes, automatically fall under Class D roads. The cross section can be decided from local level with approval from MRCC, but ensuring all road users are given sufficient rights of sharing the roadway. **7 meters** right of way has been declared for Class D roads. A Design Speed of 20 Kmph has been set for Class D roads.

Table 21: List of Class D Roads

S N	Municipal Code	NAME	Length (Km)	Ward Pass	Inter vention	Existing width	Surface
1	24M02D001	<Null>	3.07	2	Upgrade	7	Earthen
2	24M02D002	24DR009 - Sakhin Chaur Road; Chisapani - Sakhin Chaur (MTMP)	1.22	2	Upgrade	7	Earthen
3	24M02D003	<Null>	1.72	2	Upgrade	7	Earthen
4	24M02D004	<Null>	1.44	2	Upgrade	7	Earthen
5	24M02D005	<Null>	1.43	2,8	Upgrade	7	Earthen
6	24M02D006	<Null>	1.39	2,8	Upgrade	7	Earthen
7	24M02D007	<Null>	1.47	2	Upgrade	7	Earthen
8	24M02D008	<Null>	1.19	2	Upgrade	7	Earthen
9	24M02D009	<Null>	2.29	2	Upgrade	7	Earthen
10	24M02D010	<Null>	1.11	2	Upgrade	7	Earthen
11	24M02D011	<Null>	0.80	2	Upgrade	7	Earthen
12	24M02D012	<Null>	1.00	2	Upgrade	7	Earthen
13	24M02D013	<Null>	0.59	2	Upgrade	7	Earthen
14	24M02D014	<Null>	0.59	2	Upgrade	7	Earthen
15	24M02D015	<Null>	0.56	2	Upgrade	7	Earthen
16	24M02D016	<Null>	0.50	2	Upgrade	7	Earthen
17	24M02D017	<Null>	0.48	2	Upgrade	7	Earthen
18	24M02D018	<Null>	0.47	2	Upgrade	7	Earthen
19	24M02D019	<Null>	0.39	2	Upgrade	7	Earthen
20	24M02D020	<Null>	1.26	2	Upgrade	7	Earthen
21	24M02D021	<Null>	0.45	2	Upgrade	7	Earthen
22	24M02D022	<Null>	0.35	2	Upgrade	7	Earthen
23	24M02D023	<Null>	0.29	2	Upgrade	7	Earthen
24	24M02D024	Deurali Buspark to 24DR009 (short path)	0.34	2	Upgrade	7	Earthen
25	24M02D025	<Null>	0.31	2	Upgrade	7	Earthen
26	24M02D026	<Null>	0.32	2	Upgrade	7	Earthen
27	24M02D027	<Null>	0.20	2,8	Upgrade	7	Earthen
28	24M02D028	<Null>	0.14	2	Upgrade	7	Earthen

S N	Municipal Code	NAME	Length (Km)	Ward Pass	Inter vention	Existing width	Surface
29	24M02D029	<Null>	0.09	2,8	Upgrade	7	Earthen
30	24M02D030	24DR009 -Chisapani Road; Chisapani - Sakhin Chaur (MTMP)	2.09	2	Upgrade	7	Earthen
31	24M02D031	Dhulikhel Lodge resort to Shree Goshainkunda primary school	0.70	3	Upgrade	7	Earthen
32	24M02D032	<Null>	0.53	3	Upgrade	7	Bitumen
33	24M02D033	Naimisharanya kshetra road	0.50	3	Upgrade	7	Earthen
34	24M02D034	28 kilo bus stop to nilkantheshwor mahadev mandir	0.34	3,4	Upgrade	7	Bitumen
35	24M02D035	<Null>	0.77	3	Upgrade	7	Earthen
36	24M02D036	<Null>	0.27	3	Upgrade	7	Bitumen
37	24M02D037	Baasghaari Galli	0.16	3,4	Upgrade	5	Bitumen
38	24M02D038	<Null>	0.61	3	Upgrade	7	Bitumen
39	24M02D039	Pipalbot -Mukti Marga-Suwal tole – Buspark	3.49	6,7	New	0	New
40	24M02D040	<Null>	0.51	4	Upgrade	7	Bitumen
41	24M02D041	<Null>	0.49	4,5	Upgrade	7	Earthen
42	24M02D042	<Null>	0.32	4	Upgrade	7	Earthen
43	24M02D043	Nepal investment Bank Road	0.31	4	Upgrade	4	Bitumen
44	24M02D044	KU road	0.46	4	Upgrade	4	Bitumen
45	24M02D045	Staff quarter track , KU cafe - KU silver jubliee stupa	0.14	4	Upgrade	4	Bitumen
46	24M02D046	Nepal Investment bank to Bhadraa Maarga	0.53	4	Upgrade	7	Bitumen
47	24M02D047	Shreekhandapur - 28 Kilo, Bukhundol Sidi	0.12	4	Upgrade	4	Gravel
48	24M02D048	Ratamate to Bhadraa Maarga	0.30	4	Upgrade	7	Bitumen
49	24M02D049	Rajendra Marga	0.10	4	Upgrade	7	Bitumen
50	24M02D050	<Null>	0.42	5	Upgrade	7	Earthen
51	24M02D051	<Null>	0.67	5	Upgrade	7	Earthen
52	24M02D052	Bhooka tol -Budool 11	0.24	5	Upgrade	7	Earthen
53	24M02D053	<Null>	0.23	5	Upgrade	7	Earthen
54	24M02D054	<Null>	0.22	5	Upgrade	7	Earthen
55	24M02D055	<Null>	0.73	5	Upgrade	7	Earthen
56	24M02D056	Chivaahaal east-Pustakalaya	0.19	5	Upgrade	7	Gravel
57	24M02D057	<Null>	0.32	5	Upgrade	7	Earthen
58	24M02D058	Shreekhandapur - Bhairab Mandir	0.13	5	Upgrade	7	Gravel
59	24M02D059	<NULL>	0.11	5	Upgrade	7	Bitumen

S N	Municipal Code	NAME	Length (Km)	Ward Pass	Inter vention	Existing width	Surface
60	24M02D060	Punyamaata marga to Laayakoo Maarga	0.11	5	Upgrade	7	Bitumen
61	24M02D061	Laayakoo Maarga to Shreekhanda primary school	0.09	5	Upgrade	7	Bitumen
62	24M02D062	Laayakoo Maarga to Shreekhandapur - Bhairab Mandir road	0.08	5	Upgrade	7	Bitumen
63	24M02D063	Punyamata Road	0.08	5	Upgrade	7	Bitumen
64	24M02D064	<Null>	0.05	5	Upgrade	7	Bitumen
65	24M02D065	Narayan Mandir Road	0.05	5	Upgrade	7	Earthen
66	24M02D066	Korkhil Chowk - Bhairab Mandir- Ring road (MTMP), Kotkheel maarga	0.43	6	Upgrade	7	Earthen
67	24M02D067	Ganesh maarga to Dhulikhel Buspark	0.40	6,7	Upgrade	7	Bitumen
68	24M02D068	<Null>	0.38	6	Upgrade	7	Bitumen
69	24M02D069	<Null>	0.26	6	Upgrade	7	Earthen
70	24M02D070	<Null>	0.25	6	Upgrade	7	Earthen
71	24M02D071	<Null>	0.20	6	Upgrade	7	Bitumen
72	24M02D072	<Null>	0.12	6	Upgrade	7	Earthen
73	24M02D073	<Null>	0.10	6	Upgrade	7	Bitumen
74	24M02D074	Purna sanjiwani lakhanamai Road	0.08	6	Upgrade	7	Bitumen
75	24M02D075	<Null>	0.07	6	Upgrade	7	Bitumen
76	24M02D076	<Null>	0.03	6	Upgrade	7	Bitumen
77	24M02D077	Geeta maarga to Siddha pokhari marga	0.02	6	Upgrade	7	Bitumen
78	24M02D078	Ghat Khola- Thulachaur , Raana chaaap-dhulikhel	1.10	7,9	Upgrade	7	Earthen
79	24M02D079	<Null>	0.50	7	Upgrade	7	Earthen
80	24M02D080	Kamal pokhari marga	0.22	7	Upgrade	7	Bitumen
81	24M02D081	Ganesh Mandir to Siddha pokhari	0.16	7	Upgrade	7	Bitumen
82	24M02D082	<Null>	0.03	7	Upgrade	7	Bitumen
83	24M02D083	<Null>	0.03	7	Upgrade	7	Bitumen
84	24M02D084	<Null>	0.02	7	Upgrade	7	Bitumen
85	24M02D085	Khawa - Swarsati ma v - Kavreybhyanjang (MTMP), Mane Gate- Swarasati ma vi - Khawa	3.58	8	Upgrade	7	Earthen
86	24M02D086	Dadelthok to Simirinkot	2.04	8	Upgrade	7	Earthen
87	24M02D087	Dadelthok road	1.07	8	Upgrade	7	Earthen
88	24M02D088	Kharka to Harithumli to Gaurabagh Road	1.38	8	Upgrade	6	Earthen
89	24M02D089	<Null>	0.22	8	Upgrade	7	Earthen

S N	Municipal Code	NAME	Length (Km)	Ward Pass	Inter vention	Existing width	Surface
90	24M02D090	Lekadihi road	0.56	8	Upgrade	7	Earthen
91	24M02D091	<Null>	0.88	8	Upgrade	7	Earthen
92	24M02D092	<Null>	0.69	8	Upgrade	7	Earthen
93	24M02D093	<Null>	0.65	8	Upgrade	6	Earthen
94	24M02D094	<Null>	0.44	8	Upgrade	6	Earthen
95	24M02D095	Swarasati Ma v - Binayak	1.20	8	Upgrade	6	Earthen
96	24M02D096	<Null>	0.60	8	Upgrade	7	Earthen
97	24M02D097	<Null>	0.70	8	Upgrade	7	Earthen
98	24M02D098	<Null>	0.49	8	Upgrade	7	Earthen
99	24M02D099	Kampani- Terse - Khawa	0.68	8	Upgrade	7	Earthen
100	24M02D100	<Null>	0.45	8	Upgrade	7	Earthen
101	24M02D101	<Null>	0.57	8	Upgrade	7	Earthen
102	24M02D102	Dhanchare bagaincha-Kharani Danda	0.79	8	Upgrade	7	Earthen
103	24M02D103	<Null>	0.42	8	Upgrade	7	Earthen
104	24M02D104	<Null>	0.36	8	Upgrade	7	Bitumen
105	24M02D105	<Null>	0.33	8	Upgrade	7	Earthen
106	24M02D106	Sikharkateri-Dhokre Pakha	0.23	8	Upgrade	7	Earthen
107	24M02D107	<Null>	0.22	8	Upgrade	7	Earthen
108	24M02D108	<Null>	1.19	8	Upgrade	7	Earthen
109	24M02D109	Majuwa Khola - Kavreybhyanjang - Thatithok (MTMP), Daarim bot Baal pra vi-B.P highway	4.34	9,11	Upgrade	7	Earthen
110	24M02D110	Humagain Tol-Koirala tole - Bachhala school; Maskate- Thulitar-Pipal thumki (MTMP)	1.54	9,11	Upgrade	6	Earthen
111	24M02D111	<Null>	1.05	9	Upgrade	7	Earthen
112	24M02D112	<Null>	0.88	9	Upgrade	7	Earthen
113	24M02D113	HulakiPati-Panitanki (MTMP), Paani Tank to farkot	0.67	9	Upgrade	7	Earthen
114	24M02D114	Daarim bot Road	0.62	9	Upgrade	7	Earthen
115	24M02D115	<Null>	0.59	9	Upgrade	7	Earthen
116	24M02D116	<Null>	0.75	9,10	Upgrade	7	Earthen
117	24M02D117	Birta-salle pani-Khaawa	1.89	8,9	Upgrade	6	Earthen
118	24M02D118	Daarim bot Baal pra vi-B.P highway	0.68	9	Upgrade	7	Earthen
119	24M02D119	Humagain Tol-Chhotey daada	0.92	9,11	Upgrade	6	Earthen
120	24M02D120	Faskot kaarki chaap -praa vi kaarki chaap paati chaur	0.37	9	Upgrade	6	Earthen

S N	Municipal Code	NAME	Length (Km)	Ward Pass	Inter vention	Existing width	Surface
121	24M02D121	Paani tank - farkot	0.13	9	Upgrade	7	Earthen
122	24M02D122	Sunar Tole - Danda Gaun; Sunar Tole - Tinpiple (MTMP)	1.86	11	Upgrade	7	Earthen
123	24M02D123	Pipal Danda - Tinpiple ; Sunar Tole - Tinpiple (MTMP)	5.45	11	Upgrade	7	Earthen
124	24M02D124	Jukepokheri - Dobane	2.62	11	Upgrade	6	Earthen
125	24M02D125	<Null>	1.61	10,11	Upgrade	7	Earthen
126	24M02D126	Maskate- Thulitar-Pipal thumki	2.40	11	Upgrade	6	Earthen
127	24M02D127	<Null>	2.35	11	Upgrade	6	Earthen
128	24M02D128	Mathillo Pipalbot - Dhungeban	0.93	10	Upgrade	7	Earthen
129	24M02D129	<Null>	2.93	11	Upgrade	6	Earthen
130	24M02D130	Ping Danda - ite	0.38	10	Upgrade	7	Earthen
131	24M02D131	<Null>	0.66	10	Upgrade	7	Earthen
132	24M02D132	<Null>	1.34	11	Upgrade	6	Earthen
133	24M02D133	Heera Pasal - Naral Tole Road	1.23	11	Upgrade	6	Earthen
134	24M02D134	<Null>	0.65	11	Upgrade	6	Earthen
135	24M02D135	<Null>	1.67	11	Upgrade	6	Earthen
136	24M02D136	<Null>	1.00	11	Upgrade	6	Earthen
137	24M02D137	<Null>	0.74	10	Upgrade	7	Earthen
138	24M02D138	<Null>	0.85	11	Upgrade	6	Earthen
139	24M02D139	<Null>	0.96	11	Upgrade	6	Earthen
140	24M02D140	<Null>	1.09	11	Upgrade	6	Earthen
141	24M02D141	<Null>	0.19	10	Upgrade	7	Earthen
142	24M02D142	Humagain Tol-Koirala tole - Bachhala school; Ramche Chaur - Daphe Khola (MTMP)	0.66	11	Upgrade	6	Earthen
143	24M02D143	<Null>	0.65	11	Upgrade	6	Earthen
144	24M02D144	<Null>	0.62	11	Upgrade	6	Earthen
145	24M02D145	<Null>	0.59	11	Upgrade	6	Earthen
146	24M02D146	<Null>	0.56	11	Upgrade	6	Earthen
147	24M02D147	<Null>	0.48	11	Upgrade	6	Earthen
148	24M02D148	<Null>	1.08	11	Upgrade	6	Earthen
149	24M02D149	<Null>	0.47	11	Upgrade	6	Earthen
150	24M02D150	<Null>	0.52	11	Upgrade	6	Earthen
151	24M02D151	<Null>	1.08	11	Upgrade	6	Earthen
152	24M02D152	<Null>	0.36	11	Upgrade	6	Earthen
153	24M02D153	<Null>	0.46	11	Upgrade	6	Earthen
154	24M02D154	Phulbari - Bhakunde Road	0.30	11	Upgrade	6	Earthen
155	24M02D155	<Null>	0.43	11	Upgrade	6	Earthen
156	24M02D156	<Null>	0.22	11	Upgrade	6	Earthen

S N	Municipal Code	NAME	Length (Km)	Ward Pass	Inter vention	Existing width	Surface
157	24M02D157	<Null>	0.63	11	Upgrade	6	Earthen
158	24M02D158	<Null>	0.42	11	Upgrade	6	Earthen
159	24M02D159	BP HW - Sarada Batase - ite -Phaskot - Krisna Mandir	1.93	10,12	Upgrade	7	Earthen
160	24M02D160	<Null>	0.83	1	Upgrade	4	Earthen
161	24M02D161	<Null>	0.59	1	Upgrade	4	Earthen
162	24M02D162	<Null>	0.70	2	Upgrade	4	Earthen
163	24M02D163	<Null>	0.52	9	Upgrade	4	Earthen
164	24M02D164	<Null>	0.59	9	Upgrade	4	Earthen
165	24M02D165	<Null>	0.19	1	Upgrade	4	Earthen

5.7 Analysis of Road Hierarchy

Social equity is a very important parameter while providing hierarchy of road network within the Municipality. If the wards have settlement area then each ward need to be accessed by higher hierarchical road network at least SRN, DRCN and Class A or Class B roads. The road hierarchy presented in this MTMP is compatible with this requirement.

CHAPTER 6: PRIORITIZATION CRITERIA

6.1 Prioritization Criteria

A network consists of several links. Simply defined, networks are the junction or intersection and link is the distance between the junctions. Each road is important in some aspect, some serve a large population, whereas some serve the purpose of access, while some link the Ward with market or service facilities and some links act as connectors between two wards or municipalities. It is not possible to construct/maintain or upgrade all roads at a time due to time, resources and cost constraints. Looking at the importance of the road, some road need interventions are required immediately, while others can be done later on. Therefore, each link in a network needs to be prioritized and various interventions need to be taken based on the prioritization. In simple words, each road network needs to be assessed and ranked based on the intervention required.

Roads need to be prioritized using the same assessment and criteria. This will help to reduce the bias and a transparent and fair result will be obtained, free from any influence. The selection criteria for prioritization can be site specific, but it needs to be consistent for all links/roads within the study area. Theoretically, basic criteria may include existing population within the zone of influence of the road, present road demand, future potential route, accessibility situation, land use pattern, environmental and social safeguard, proximity to the market/service centres, religious and tourism places. The selection of criteria needs to be comprehensive (ensuring no major criteria is excluded) and independent. There will be different levels of importance of each criterion and thus, each criterion is given certain score or weightage. Finally, a weighted average of all the criteria is summed up to come with a priority of intervention. If the summation score assigned to each criteria is equal to 100, simply sum of score will gives us the Total/Final score, otherwise the final score will be equal to weightage average of each criteria. The final score will be the sole basis of prioritization. The higher the score, the higher the rank and therefore intervention will be undertaken sooner. The road link and interventions that achieve the highest score will be ranked as “Number 1 priority intervention” and will be the first intervention to be carried out. The scoring criteria and their weightage/score remains the same for all road links as well as for all type of intervention.

6.2 Proposed Scoring Criteria

After rigorous study (review of literature around the world and past experience) and ToR, following prioritization criteria is published. Eight ranking/prioritization indicators are included as prioritization indicators, including the following:

Table 22: Proposed Scoring Criteria with Score for Prioritization

S. No	Scoring Criteria	Scoring Unit	Score
1	Demand Priority of wards		10
2	Total existing width	Meter	10
3	Population served		10
4	Road network benefit (access to service centers ,recreational Centre, agricultural Centre and market)		20
5	Link to future development potential sites		20
6	Link to other road network (SRN, District roads, Airport)		10
7	Road Surface		10
8	Access to poor and minority group and special placed indicated by Municipality.	Yes/No	10

A. Demand priority of wards:

Demand priority is the one of the major criteria for prioritization. Each ward has requested interventions in prioritised order by completing a "Demand Form" listing priority projects one to five. These priority priority projects are based on present ward resident needs, i.e. the project at number 1 priority needs to be done first. The higher the priority of intervention, the higher the score. If certain intervention receive highest priority i.e. number 1 priority in certain ward level, then it need to get full marks. The road identified as first priority will get full marks and the score will reduced by 20 % for each lower level priority; i.e. second priority road will get 80% score. Lowest priority (5th priority) link intervention will get twenty percent of total score. And all other roads will get 10% of the total score. The road link with different priority from different wards will get the average score.

B. Existing Width of Road:

Existing width is also the next criterion for prioritization. The present width of the road is the indicator of the importance of the road. A road which is wider among many roads within the Municipality carries slightly more importance than other roads. Therefore the widest road is given highest priority and thus full score. As a new proposed road does not have width at present day, allocating a Zero score obscures its importance. Therefore, new proposed roads are given 25% of the total score. Road width within zero and maximum width is given score based on relative scoring. The score for road with variable width will be based on average width.

C. Population Served

Population coverage by the road linkage is one of the important indicataors of prioritization. The higher the population served by the road, the higher will be its necessity or importance and need for it to be constructed/upgraded/maintained first. Therefore, high score is assigned for the road link serving high population and all other score is based on the relative marking wit. Now the question arises which population can be considered as high population and thus relative score is provided. Among all roads within the Municipality, road serving maximum population is given full marks and the other roads are provided score accordingly. Thus, the score for road based on population served lies within zero to full score.

D. Road Network Benefit (RAMS)

It is one of the main governing prioritization indicator. The road link may provide access to recreational (picnic spot, historical place, park, cinema hall, playground), agricultural land, market centre and service centre (schools, health post, governmental offices, etc.). A single road link can serve just a single function to all above four function. Simply more the services road link offers more will be the importance of the road link/network. The proposed road intervention which serve all four facilities is regarded as the major intervention which need immediate attention and thus it is provided with highest full marks. If the road link only serve any three function/purpose, the score is reduced to 80% of the total final marks. Similarly, link serving any of the two function is provided with 60% and the road which serve only a single function is provided with 40%.

E. Future Potential Development

Potential future development is one of the main governing prioritization indicators. The higher the future potential development within an area, the greater the necessity to construct, upgrade and/or maintain the roads. Therefore, a higher score is assigned for the potential road and all other score is based on the relative marking weight. Among all roads within the Municipality, the road serving maximum potential development is given full marks and the other roads are provided scores accordingly. Therefore, the score for roads based on future development potential lies within zero to full score.

F. Links to other road networks

This is one of the main governing prioritization indicators. The proposed road intervention which joins SRN, Feeder road or District roads is regarded as requiring immediate attention and therefore it is provided with highest full marks. If the road link only serves any two functions/purposes, the score is reduced to 80% of the total final marks. Similarly, a link serving any of the one function is provided with 60% and the road which serve from a Class A road is provided with 40%.

G. Existing Road Surface

The road surface type also governs the scoring and prioritization of the road. There are two principles behind which type of road to prioritize. The first principle is the objective need to be accessible, i.e. first make the road fully accessible so that it can be operated in all weather conditions (all-weather access). The second principle says the road importance is dependent on surface type, ie. the road which is bituminous at present has great importance and needs to be maintained first compared to upgrading earthen road. Both principles have a significant impact on overall prioritization. Basically, the road which has bituminous or metalled road surface generally serves a larger population and has significant width and therefore it will attract high marks in those criteria. However, this study allocates highest priority to earthen surfaced roads as we are mainly concern with accessibility first. Earthen surfaced roads acquire full marks, gravel surface roads acquire 80% of total and bituminous/metalled roads recieve 60% of total score. If a single road has different surfaces in different sections, then the weightage average based on length is taken and score is provided accordingly.

H. Social Equity

Social equity is also another indicator of road prioritization. The road link/network needs to be established to give access to all groups of people and there should not be discrimination while providing services, i.e. concept of "equality for all". Road links that provide the access to minority peoples (areas inhabited by disadvantaged and poor ethnic groups/communities, isolated remote areas) need to be given priority. The usual approach is these people lives far from the original settlement and they are fewer in number, therefore the road serving them will have low road density, low settlement density and low population and thus low score. However, from social equity perspective, these roads need to be given some extra score. If the road provides access to minority group in large level, it is awarded with full marks. If the road link provides access but to smaller extent it is provided with half the full score and if it does not serve any such groups, zero marks is given to such road link intervention.

These prioritization criteria have been set up and used to prioritize the road linkages of all hierarchy of roads as budgeting is expected to be 70% of total budget to be used in road construction whereas 30% of the total budget is used in road maintenance. From the total construction cost based on MTMP guidelines 10%, 35%, 45% and 10% are used for the construction of A class road, B class road, C class road and D class road respectively.

CHAPTER 7: FIVE YEAR MUNICIPAL TRANSPORT MASTER PLAN

7.1 Implementation Plan

The Implementation Plan for the Municipal Road Network includes the upgrading and maintenance of the access and collector roads and development of higher hierarchy road corridors supporting mobility of the roads.

Short term - The first five years should focus on development of existing access roads and their maintenance. It also incorporates construction of new road linkages to provide basic access to the settlements.

7.2 Short term Municipality Transport Master Plan (Five years)

The short-term Municipality transport master plan has been developed to guide the municipal investments on road infrastructure and need to be compatible with the medium and long term planning. Short term planning elements generally known as transportation system management (TSM) are basically meant for efficient use of existing and proposed infrastructure (Verma and Ramanaya, 2015). The period of short-term plan controls the encroachment and urban sprawl growth along the ROW of the Class B roads.

Survey results show majority of the households do not own any vehicle, and most trips are made either by public transport or by walking, So, besides making more appropriate route for Public transport vehicles, a strategy towards improving/creating cycle tracks and footpath needs to delivered within this MTMP period. Similarly, the roads which are earthen need to be gravelled from maintenance fund or from local share. Also, the right of way needs to be introduced in general public level and the concept of land pooling need to be adopted.

Class “C” Roads will be widened to provide proper cycle tracks and pedestrian ways where permitted by the available road space.

During this period, formulated road hierarchy will be implemented in terms of policy and enforcement of bylaws. Within 2 years’ other complementary plans of land use and city development will be developed (through Masterplanning of Urban Dhulikhel) and the village settlements.

In the third year, the MTMP and its perspective plan should be revised in coordination with the other plans formulated and changes captured during this period.

Summary of short-term plan:

- Links for public transport routes
- Improving/creating cycle tracks and footpaths
- Through 'soft' engineering interventions 'signage, road surface changes and speed limits' make urban areas 'pedestrian priority areas'
- Resurface earthern roads to gravelled surfaces (all-weather access)
- Adopt land pooling as a method to facilitate widening of Category A and B roads if required
- Apply the Public Use Zone to Class A and B Roads to prevent further construction of permanent structures on land within the designated ROW.

7.3 Medium term Municipality Transport Master Plan

Medium term planning will implement the higher hierarchy roads in stages of clearing of the required ROW and infrastructure facilitation. Proper development stages of roads should be planned (construction of Class "A" roads to the standards of Class "C", then gradually upgrading to Class "B" and to Class "A"). Other implementation strategies should be developed and finalized at the end of this period. The road network developed during this period shall complete construction of Class "C" roads. Gradual upgrading of the higher hierarchy road networks during year ten to twenty will be justified by the traffic generated and level of mobility demanded to support the emerging economy.

Land development and management should go parallel with clearance of RoW of higher classes of road. Road corridor development projects should be introduced for acquisition of land required to clear RoW for various classes of road. Each road project requires to be individual project. The development project is aimed at minimizing social, financial and physical loss. The process of development needs to internalize the value created beyond the corridor as a result of corridor development in trickle down order. Generation and sales of sales plot can be enough to compensate for physical loss of building and account for social exclusion and rehabilitation. Moreover, the development project should be launched by the land owners' committee rather than central government.

The Medium term plan continues the development and maintenance of the access roads and, expansion and maintenance of collector roads to their respective standard layout. Class "B" roads will also need to be constructed and expanded during the medium-term plan depending upon the necessity/demand of road hierarchy. All the roads of Class "C" will be constructed and maintained at their designated standard layout at the end of medium-term plan. Class "B" and Class "A" roads will also be constructed wide enough to address the demand generated during this period. Few class "B" roads will be constructed to their full width with designated pedestrian paths and cycle tracks. For other class "B" roads, the medium-term time period will allow opening of the track by shifting the existing structures and stopping further construction of other structures within the designated ROW.

The service centers and market areas is expected to grow rapidly in wards **6 and 7**, so it is expected to occur the parking problem in these wards. Thus parking management is must in these wards. This can be achieved by allocating areas for communal parking on the edge of bazar areas. The only buspark in the municipality is also not sufficient to cope the increasing parking demand. These issues will be resolved during the Masterplanning process for Urban Dhulikhel (refer to Volume 2, Physical Development Plan, that sets out this process).

Summary of medium-term plan:

- Construct Class "B" roads depending upon the necessity/demand of road hierarchy, including provision for cycling infrastructure.
- Construct and maintain all Class "C" roads to their designated standard layout
- In wards **6 and 7 (Market centres)**, allocate designated communal parking areas for residents and visitors (identified through masterplanning of these areas).
- Upgrade the Dhulikhel buspark to accommodate increasing bus-parking demand.

7.4 Long Term Municipality Transport Master Plan (Twenty Years)

Long term Municipal Transport Master Plan envisages the development of the roads of all hierarchy within the Municipality as depicted by the perspective plan in full phase. First ten years is critical in developing proper implementation policies, tools and plans for the construction and implementation of the standards of these roads in the long-term planning period of ten to twenty years. Plans to integrate other service facilities such as electricity, drainage and drinking water pipes should be developed during this period.

7.5 Municipal Transport Financial Plan

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

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

Planning of the investment is essential to support local government in developing good and best practice in construction, upgrading, overall asset management and especially operation and maintenance the road project. The grass root level involvement in the development of the road sector helps to create an informed and responsible citizen in the society. Thus, it is important to have local people's participation in the construction works of the local access roads. A majority (if not all) the local access roads should be constructed by the local people in coordination with the municipality. People's participation can be achieved in plantation alongside of the roads, cleaning of the road area and other activities.

The Municipality has a major role in developing the roads. It has the responsibility of preparing the necessary framework and implementing policies and strategies for the planned development of the municipal roads and thus the municipality as a whole. A major share of the municipal budget should be used to maintain the roads and construct 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 over a longer period of time.

Other institutions are district and division line agencies such as DoR, DoLIDAR. These institutions are responsible for the development of road corridors that are important to the district or a larger area as a whole. Their contribution may or may not invest in the roads within the municipality, but wider roads of the municipality that extends to the boundary to other VDC/districts may draw investment beyond the municipal boundary. This will ultimately help in the development of the local municipal market centre.

The development of higher hierarchy road corridors cannot be directly developed by the municipality's annual budget alone. This needs bigger investment. This is where the central government or the ministry might want to invest as these higher hierarchy roads are meant for mobility and can provide greater coverage beyond the municipality in the future. These roads can be upgraded to expressways. The budget that flows into the municipality for the development of MTMP roads should come from an earmarked fund (one window) and not from specific institution.

धुलिखेल नगरपालिका

नगर कार्यपालिकाको कार्यालय, धुलिखेल

आ.व. २०७४/७५ को संशोधित तथा २०७५/७६ को बजेट तथा कार्यक्रमको सारांश

सि.नं.	खर्च शीर्षक	खर्च संकेत	२०७४/७५ को संशोधित अनुमान	२०७५/७६ को प्रस्तावित अनुमान	२०७५/७६ को प्रस्तावित अनुमानको स्रोत									
					आन्तरिक	संघीय सरकार				प्रदेश सरकार				अन्य स्रोत
						राजश्व बाँडफाँट	समानीकरण	स-शर्त	समपुरक	राजश्व बाँडफाँट	समानीकरण	स-शर्त	समपुरक	
५५	सडक तथा पुल निर्माण	३११५१		९१७०००००	१५०००००	१००००००	१६२७०००००		८०००००	२२३०००००		२२१३००००	५०००००	१५५०००००

Table: Budget for Fiscal Yr. 2075/76

7.6 Five Years budget Expenditure

Provision of annual budget expenditure for road projects (new construction, upgrading, maintenance and rehabilitation) is one of the final outcomes of the study. The budget plan is based on a realistic approach and takes consideration the annual allocated budget of municipality. Should the road project not be completed in the preceding year, it 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, it needs to be given first priority in next year's expenditure plan. If there is a deficit in annual expenditure, the 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 reallocating less important budget items.

Budgeting of roads has been divided according to interventions:

i. Construction and upgrading (70%)
ii. Maintenance (30%)

Budgeting of municipal roads has been calculated starting from total cost required for interventions (construction and upgrading) to be provided for road classes "A", "B" and "C" in the respective of 20 years. The cost is divided into twenty years on the assumption of capacity enhancement of the municipality by 10% each year. The cost of construction and upgrading of road of class "D" is subjected to 10% of total cost of construction and upgrading. Class A road owes 10%, Class B 35% and Class C 45%.

30% of the funds available for municipal roads have been allocated to maintenance costs. Yearly maintenance plans according to need-based assessment of required maintenance have to be prepared and cost allocation needs to be done through this plan. Rs 10 lakhs required for advocacy and promotion of higher classes of road for clearance of RoW through land development and land pooling projects is allocated from budget available for maintenance. These projects of road corridor development should be conducted by directly involving local people.

In absence of specific funds granted for special projects, all other funds available to the Municipality for the construction of roads should come through one window system,

collected in a single basket and allocated to the roads based on ranking of roads. Normally, the construction and upgrading of prioritized roads into bituminous pavement shall be completed one kilometre for each road each year. This practice could be relaxed for special cases where shorter length sections remain for construction in the later years. This plan is aimed to include more roads maintaining standards of construction within five years of MTMP.

It is assumed that all roads and interventions will be completed within a 20-year time period and on this basis the yearly budget has been calculated. The total cost of total intervention is 26309 Lakhs.

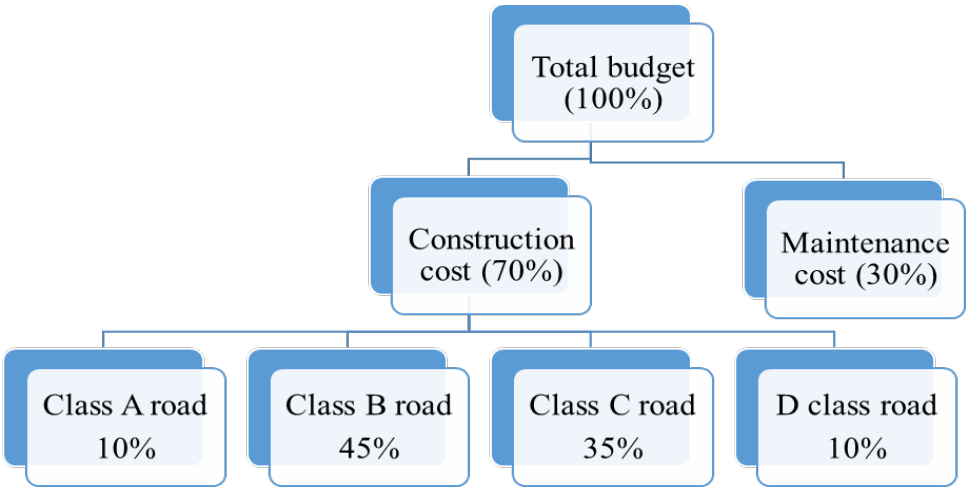


Figure 17: Expenditure Breakdown

Class A in short term will be made of 5.5m intermediate lane with 1.5m total shoulder width. All the other roads will be made of 4m with 1.5 m of shoulder and 0.5m of drain on either side (where required).

Retaining structure cost and cost of pipe culvert cost is tentatively calculated using the "rule of thumb" that about 5% of total road construction cost goes to structure, although this value may increase in some segments and might be too low for other segments. Hence generalizing we came with that value.

Table 23: Total Budget allocation on Total Road Intervention

Year	Cost of various Intervention (In Lakhs)							
	Class A	Class B	Class C	Class D	Mainte nance	Total	Probable Budget	Deficit
1	64	224	288	70	276.85	922.85	641	281.85

2	70	247	317	68.2	301	1003.2	706	297.2
3	77	271	349	77	331.7	1105.7	776.7	329
4	85	299	384	85	365.57	1218.57	854	364.57
5	93	328	422	93.9	401.5	1338.4	839.8	498.6

S. No.	Municipal Code	Existing surfce	Surface type to be made	Total Length(KM)	Type of CD Structures			New Construction	Existing Width (m)	Drainage (m)	Pavement width(m)	Gravel width	Recurrent Maintenance	Total Cost	Pavement cost	CDS and DS cost	Track Opening Cost	Gravelling Cost	Total Cost for Short Term	Per Km Cost
					Bridge	Cause way	Culvert													
1	24M01A001	New	Gravel	6.46		4.0		**6.46**	**0.0**	12920.0	3.75	1.5		195031428.6	39452142.9	16920000.0	25840000.0	6090857.1	88303000.0	13669195.0
2	24M01A002	New	Gravel	1.75	1.0		1.0	**1.75**	**0.0**	3500.0	3.75	1.5		82425000.0	10687500.0	4775000.0	7000000.0	1650000.0	24112500.0	13778571.4
3	24M01B001	Gravel	Bitumen	2.72				0.00	5.0	5440.0	5.50	1.5		61005714.3	24363428.6	5440000.0	0.0	2564571.4	32368000.0	11900000.0
4	24M01B002	Gravel	Bitumen	0.33				0.00	6.0	660.0	5.50	1.5		7401428.6	2955857.1	660000.0	0.0	311142.9	3927000.0	11900000.0
5	24M01B003	New	Gravel	2.66		2.0		**2.66**	**0.0**	5320.0	5.50	1.5		72300000.0	23826000.0	7320000.0	10640000.0	2508000.0	44294000.0	16651879.7
6	24M01B004	Bitumen	Recurrent Maintenance	0.49				0.00	7.0	980.0	5.50	0.0	0.49	1225000.0	4389000.0	980000.0	0.0	0.0	5369000.0	10957142.9
7	24M01B005	Earthen	Gravel	2.28				0.00	7.0	4560.0	5.50	1.5		51137142.9	20422285.7	4560000.0	0.0	2149714.3	27132000.0	11900000.0
8	24M02B006	Earthen	Gravel	0.78				0.00	7.0	1560.0	5.50	1.5		17494285.7	6986571.4	1560000.0	0.0	735428.6	9282000.0	11900000.0
9	24M02B007	Earthen	Gravel	1.18				0.00	7.0	2360.0	5.50	1.5		26465714.3	10569428.6	2360000.0	0.0	1112571.4	14042000.0	11900000.0
10	24M02B008	Earthen	Gravel	0.21				0.00	7.0	420.0	5.50	1.5		4710000.0	1881000.0	420000.0	0.0	198000.0	2499000.0	11900000.0
11	24M02B009	Bitumen	Recurrent Maintenance	0.65				0.00	7.0	1300.0	5.50	0.0	0.65	1625000.0	5822142.9	1300000.0	0.0	0.0	7122142.9	10957142.9
12	24M02C001	Earthen	Gravel	5.91		5.0	1.0	0.0	4	11817.5	5.50	1.5		95994632.4	52925616.4	17492522.0	0.0	5571117.5	75989255.9	12860438.2
13	24M02C002	Earthen	Gravel	4.85		4.0	1.0	0.0	4	9691.9	5.50	1.5	4.85	78748791.9	43405857.5	14366898.0	0.0	4569037.6	62341793.1	12864723.3
14	24M02C003	Earthen	Gravel	2.80				0.0	4	5601.0	5.50	1.5		42807704.0	25084514.4	5601008.0	0.0	2640475.2	33325997.6	11900000.0
15	24M02C004	Earthen	Gravel	3.19				0.0	4	6388.6	5.50	1.5		48827401.7	28611944.7	6388632.0	0.0	3011783.7	38012360.4	11900000.0
16	24M02C005	Earthen	Gravel	2.04				0.0	4	4079.3	5.50	1.5		31177797.6	18269606.6	4079338.0	0.0	1923116.5	24272061.1	11900000.0
17	24M02C006	Earthen	Gravel	1.01				0.0	4	2016.0	5.50	1.5		15408107.0	9028862.7	2016014.0	0.0	950406.6	11995283.3	11900000.0
18	24M02C007	Earthen	Gravel	1.51				0.0	4	3017.2	5.50	1.5		23059936.9	13512692.0	3017188.0	0.0	1422388.6	17952268.6	11900000.0
19	24M02C008	Earthen	Gravel	1.62				0.0	4	3249.3	5.50	1.5		24833630.0	14552043.0	3249260.0	0.0	1531794.0	19333097.0	11900000.0
20	24M02C009	Earthen	Gravel	1.45				0.0	4	2897.9	5.50	1.5		22148006.4	12978317.8	2897870.0	0.0	1366138.7	17242326.5	11900000.0
21	24M02C010	Earthen	Gravel	0.85				0.0	4	1703.7	5.50	1.5		13021196.9	7630178.0	1703708.0	0.0	803176.6	10137062.6	11900000.0
22	24M02C011	Earthen	Gravel	0.59				0.0	4	1171.3	5.50	1.5		8951696.4	5245526.8	1171250.0	0.0	552160.7	6968937.5	11900000.0
23	24M02C012	Earthen	Gravel	0.57				0.0	4	1132.5	5.50	1.5		8655535.7	5071982.1	1132500.0	0.0	533892.9	6738375.0	11900000.0
24	24M02C013	Earthen	Gravel	0.56				0.0	4	1117.6	5.50	1.5		8541534.9	5005179.8	1117584.0	0.0	526861.0	6649624.8	11900000.0
25	24M02C014	Earthen	Gravel	4.15				0.0	4	8290.4	5.50	1.5		63362297.0	37129121.7	8290394.0	0.0	3908328.6	49327844.3	11900000.0
26	24M02C015	Earthen	Gravel	3.20				0.0	4	6397.2	5.50	1.5		48893023.3	28650397.8	6397218.0	0.0	3015831.3	38063447.1	11900000.0
27	24M02C016	Earthen	Gravel	2.62		5.0	4.0	0.0	4	5246.0	5.50	1.5		47794214.6	23494460.3	12945972.0	0.0	2473101.1	38913533.4	14835585.6
28	24M02C017	Earthen	Gravel	1.94			1.0	0.0	4	3874.8	5.50	1.5		30289863.9	17353756.7	4549842.0	0.0	1826711.2	23730309.9	12248401.3
29	24M02C018	Earthen	Gravel	4.34	1.0			0.0	4	8674.8	5.50	1.5		96300058.4	38850595.0	9274774.0	0.0	4089536.3	52214905.3	12038332.1
30	24M02C019	Earthen	Gravel	0.73				0.0	4	1463.0	5.50	1.5		11181163.7	6551952.9	1462956.0	0.0	689679.3	8704588.2	11900000.0
31	24M02C020	Earthen	Gravel	3.18				0.0	4	6351.6	5.50	1.5		48544600.7	28446228.6	6351630.0	0.0	2994339.9	37792198.5	11900000.0
32	24M02C021	Earthen	Gravel	2.64				0.0	4	5286.8	5.50	1.5		40406379.4	23677383.1	5286816.0	0.0	2492356.1	31456555.2	11900000.0
33	24M02C022	Earthen	Gravel	4.14		1.0	2.0	0.0	4	8279.8	5.50	1.5		65631298.0	37081657.8	10629796.0	0.0	3903332.4	51614786.2	12467646.8
34	24M02C023	Earthen	Gravel	1.62				0.0	4	3236.1	5.50	1.5		24733386.3	14493302.1	3236144.0	0.0	1525610.7	19255056.8	11900000.0
35	24M02C024	Gravel	Bitumen	3.55			3.0	0.0	4	7100.1	5.50	1.5		56290157.0	31798367.7	9125114.0	0.0	3347196.6	44270678.3	12470413.4
36	24M02C025	Earthen	Gravel	0.93				0.0	4	1859.6	5.50	1.5		14212611.3	8328324.6	1859594.0	0.0	876665.7	11064584.3	11900000.0
37	24M02C026	Bitumen	Recurrent Maintenance	0.29				0.0	4	577.4	5.50	1.5	0.29	4557493.6	2586016.7	577420.0	0.0	272212.3	3435649.0	11900000.0

38	24M02C027	Bitumen	Recurrent Maintenance	0.23				0.0	4	463.6	5.50	1.5	0.23	3659049.6	2076220.9	463590.0	0.0	218549.6	2758360.5	11900000.0
39	24M02C028	Bitumen	Recurrent Maintenance	1.76				0.0	4	3515.7	5.50	1.5	1.76	27749296.7	15745528.5	3515748.0	0.0	1657424.1	20918700.6	11900000.0
40	24M02C029	Gravel	Bitumen	1.59				0.0	4	3186.4	5.50	1.5		24353352.9	14270609.6	3186420.0	0.0	1502169.4	18959199.0	11900000.0
41	24M02C030	Gravel	Bitumen	0.62				0.0	4	1243.7	5.50	1.5		9505482.6	5570035.1	1243708.0	0.0	586319.5	7400062.6	11900000.0
42	24M02C031	Gravel	Bitumen	0.61				0.0	4	1217.6	5.50	1.5		9306309.7	5453323.5	1217648.0	0.0	574034.1	7245005.6	11900000.0
43	24M02C032	Gravel	Bitumen	0.44				0.0	4	885.0	5.50	1.5		6764173.1	3963679.0	885032.0	0.0	417229.4	5265940.4	11900000.0
44	24M02C033	Bitumen	Recurrent Maintenance	0.40				0.0	4	794.8	5.50	1.5	0.40	6273369.1	3559640.2	794816.0	0.0	374699.0	4729155.2	11900000.0
45	24M02C034	Bitumen	Recurrent Maintenance	0.71				0.0	4	1413.2	5.50	1.5	0.71	11153870.0	6328938.0	1413160.0	0.0	666204.0	8408302.0	11900000.0
46	24M02C035	Bitumen	Recurrent Maintenance	0.23				0.0	4	467.0	5.50	1.5	0.23	3686201.1	2091627.2	467030.0	0.0	220171.3	2778828.5	11900000.0
47	24M02C036	Bitumen	Recurrent Maintenance	1.57				0.0	4	3147.6	5.50	1.5	1.57	24843809.7	14096894.7	3147632.0	0.0	1483883.7	18728410.4	11900000.0
48	24M02C037	Gravel	Bitumen	0.48				0.0	4	963.0	5.50	1.5		7359872.7	4312747.8	962974.0	0.0	453973.5	5729695.3	11900000.0
49	24M02C038	Bitumen	Recurrent Maintenance	0.28				0.0	4	569.1	5.50	1.5	0.28	4491682.9	2548674.4	569082.0	0.0	268281.5	3386037.9	11900000.0
50	24M02C039	Gravel	Bitumen	0.81				0.0	4	1618.2	5.50	1.5		12367319.9	7247018.3	1618154.0	0.0	762844.0	9628016.3	11900000.0
51	24M02C040	Gravel	Bitumen	0.25				0.0	4	503.6	5.50	1.5		3849156.9	2255534.0	503628.0	0.0	237424.6	2996586.6	11900000.0
52	24M02C041	Gravel	Bitumen	0.50				0.0	4	998.6	5.50	1.5		7631836.1	4472113.3	998558.0	0.0	470748.8	5941420.1	11900000.0
53	24M02C042	Bitumen	Recurrent Maintenance	0.34				0.0	4	682.1	5.50	1.5	0.34	5383575.8	3054753.0	682082.0	0.0	321552.9	4058387.9	11900000.0
54	24M02C043	Bitumen	Recurrent Maintenance	0.21				0.0	4	425.7	5.50	1.5	0.21	3359736.7	1906384.5	425668.0	0.0	200672.1	2532724.6	11900000.0
55	24M02C044	Bitumen	Recurrent Maintenance	0.31				0.0	4	626.4	5.50	1.5	0.31	4944290.9	2805493.6	626426.0		295315.1	3727234.7	11900000.0
56	24M02C045	Bitumen	Recurrent Maintenance	0.15				0.0	4	304.5	5.50	1.5	0.15	2403311.9	1363689.2	304492.0		143546.2	1811727.4	11900000.0
57	24M02C046	Bitumen	Recurrent Maintenance	0.10				0.0	4	205.3	5.50	1.5	0.10	1620072.1	919262.6	205258.0		96764.5	1221285.1	11900000.0
58	24M02C047	Bitumen	Recurrent Maintenance	0.10				0.0	4	198.2	5.50	1.5	0.10	1564427.4	887688.7	198208.0		93440.9	1179337.6	11900000.0
59	24M02C048	Earthen	Gravel	1.77		1.0		0.0	4	3547.9	5.50	1.5		28115726.0	15889308.6	4547852.0		1672558.8	22109719.4	12463721.4
60	24M02C049	Bitumen	Recurrent Maintenance	2.28				0.0	4	4555.2	5.50	0.0	2.28	35953495.5	20400761.7	4555194.0		0.0	24955955.7	10957142.9
61	24M02C050	Bitumen	Recurrent Maintenance	0.70				0.0	4	1404.7	5.50	1.5	0.70	11086828.1	6290897.0	1404666.0		662199.7	8357762.7	11900000.0
62	24M02C051	Gravel	Bitumen	0.62				0.0	4	1231.4	5.50	1.5		9411628.3	5515038.3	1231428.0		580530.3	7326996.6	11900000.0
63	24M02C052	Gravel	Bitumen	0.62				0.0	4	1243.7	5.50	1.5		9505085.1	5569802.2	1243656.0		586295.0	7399753.2	11900000.0
64	24M02C053	Bitumen	Recurrent Maintenance	0.53				0.0	4	1065.4	5.50	1.5	0.53	8409018.4	4771452.1	1065396.0		502258.1	6339106.2	11900000.0
65	24M02C054	Gravel	Bitumen	0.33				0.0	4	658.8	5.50	1.5		5034839.1	2950321.6	658764.0		310560.2	3919645.8	11900000.0
66	24M02C055	Earthen	Gravel	0.26				0.0	4	519.5	5.50	1.5		3970219.7	2326474.5	519468.0		244892.1	3090834.6	11900000.0

67	24M02C056	Bitumen	Recurrent Maintenance	0.19				0.0	4	378.2	5.50	1.5	0.19	2984889.1	1693688.2	378176.0		178283.0	2250147.2	11900000.0
68	24M02C057	Earthen	Gravel	2.74		1.0	1.0	0.0	4	5479.4	5.50	1.5		43553317.3	24539911.2	7154406.0		2583148.5	34277465.7	12511380.1
69	24M02C058	Earthen	Gravel	1.66				0.0	4	3310.8	5.50	1.5		25303956.1	14827645.3	3310798.0		1560804.8	19699248.1	11900000.0
70	24M02C059	Earthen	Gravel	2.25				0.0	4	4503.5	5.50	1.5		34419439.0	20169147.9	4503478.0		2123068.2	26795694.1	11900000.0
71	24M02C060	Earthen	Gravel	2.16				0.0	4	4324.4	5.50	1.5		33050802.0	19367152.2	4324404.0		2038647.6	25730203.8	11900000.0
72	24M02C061	Earthen	Gravel	2.24				0.0	4	4474.8	5.50	1.5		34200532.3	20040872.7	4474836.0		2109565.5	26625274.2	11900000.0
73	24M02C062	Earthen	Gravel	3.94		1.0		0.0	4	7887.5	5.50	1.5		61283265.0	35324866.5	8887530.0		3718407.0	47930803.5	12153564.8
74	24M02C063	Earthen	Gravel	10.09	1.0	1.0		0.0	4	20170.2	5.50	1.5		185157926.6	90333663.5	21770196.0		9508806.7	121612666.2	12058649.9
75	24M02C064	Earthen	Gravel	0.60				0.0	4	1195.4	5.50	1.5		9136133.9	5353603.7	1195382.0		563537.2	7112522.9	11900000.0
76	24M02C065	Earthen	Gravel	1.56				0.0	4	3129.3	5.50	1.5		23916869.3	14014838.4	3129310.0		1475246.1	18619394.5	11900000.0
77	24M02C066	Earthen	Gravel	2.91		4.0		0.0	4	5816.3	5.50	1.5		48452981.9	26048616.5	9816278.0		2741959.6	38606854.1	13275450.1
78	24M02C067	Earthen	Gravel	1.46				0.0	4	2916.4	5.50	1.5		22289873.1	13061449.0	2916432.0		1374889.4	17352770.4	11900000.0
79	24M02C068	Earthen	Gravel	2.39				0.0	4	4785.1	5.50	1.5		36571514.7	21430224.0	4785058.0		2255813.1	28471095.1	11900000.0
80	24M02C069	Earthen	Gravel	2.45			2.0	0.0	4	4901.1	5.50	1.5		38808697.6	21950096.6	6251138.0		2310536.5	30511771.1	12450892.5
81	24M02C070	Earthen	Gravel	2.05				0.0	4	4108.5	5.50	1.5		31400770.3	18400264.5	4108512.0		1936869.9	24445646.4	11900000.0
82	24M02C071	Earthen	Gravel	1.89				0.0	4	3780.9	5.50	1.5		28896588.1	16932860.5	3780862.0		1782406.4	22496128.9	11900000.0
83	24M02C072	Earthen	Gravel	1.89		1.0		0.0	4	3777.7	5.50	1.5		29872513.1	16918753.0	4777712.0		1780921.4	23477386.4	12429421.0
84	24M02C073	Earthen	Gravel	1.08				0.0	4	2154.7	5.50	1.5		16468094.9	9649995.8	2154704.0		1015789.0	12820488.8	11900000.0
85	24M02C074	Earthen	Gravel	1.06	1.0		1.0	0.0	4	2121.5	5.50	1.5		46889489.6	9501387.8	3396522.0		1000146.1	13898055.9	13101967.3
86	24M02C075	Earthen	Gravel	0.73				0.0	4	1459.6	5.50	1.5		11155728.3	6537048.3	1459628.0		688110.3	8684786.6	11900000.0
87	24M02C076	Earthen	Gravel	0.59				0.0	4	1182.5	5.50	1.5		9037785.6	5295973.4	1182514.0		557470.9	7035958.3	11900000.0
88	24M02C077	Earthen	Gravel	0.45				0.0	4	895.1	5.50	1.5		6840861.6	4008617.0	895066.0		421959.7	5325642.7	11900000.0
89	24M02C078	Earthen	Gravel	0.45				0.0	4	891.2	5.50	1.5		6810978.0	3991105.8	891156.0		420116.4	5302378.2	11900000.0
90	24M02C079	Earthen	Gravel	2.52				0.0	4	5037.4	5.50	1.5		38500205.0	22560400.5	5037410.0		2374779.0	29972589.5	11900000.0
91	24M02C080	Earthen	Gravel	0.26				0.0	4	526.7	5.50	1.5		4025462.3	2358845.7	526696.0		248299.5	3133841.2	11900000.0
92	24M02C081	Earthen	Gravel	0.11				0.0	4	212.9	5.50	1.5		1627363.0	953604.3	212926.0		100379.4	1266909.7	11900000.0
93	24M02C082	Earthen	Gravel	0.20				0.0	4	390.7	5.50	1.5		2985835.0	1749643.5	390670.0		184173.0	2324486.5	11900000.0
94	24M02C083	Earthen	Gravel	0.28				0.0	4	555.4	5.50	1.5		4244735.9	2487335.9	555386.0		261824.8	3304546.7	11900000.0
95	24M02C084	Earthen	Gravel	0.27				0.0	4	540.8	5.50	1.5		4132936.1	2421823.3	540758.0		254928.8	3217510.1	11900000.0

Budget allocated for various classes of roads for Five years

S. No.	Code	Score	Length	YEAR I		Year II		Year III		Year IV		Year V		Length Completed
				Length	Cost	Length	Cost	Length	Cost	Length	Cost	Length	Cost	
							A Class Roads							
1	24M01A001	1.00	6.46	-	-	0.26	3,530,450.00	0.28	3883495	0.31	4271844.5	0.25	3383300.844	**1.10**
2	24M01A002	2.00	1.75	0.47	6,419,000.00	0.26	3,530,450.00	0.28	3,883,495.00	0.31	4,271,844.50	0.44	6,014,757.06	**1.75**
			8.21	**0.47**	**6,419,000.00**	**0.51**	**7,060,900.00**	**0.57**	**7,766,990.00**	**0.62**	**8,543,689.00**	**0.68**	**9,398,057.90**	**2.85**
							B Class Roads							
2	24M01B001	1.00	2.72	0.94	11,233,250.00	0.93	11,120,917.50	0.85	10,058,252.05	0.00	-	0.00	-	**2.72**
3	24M01B002	2.00	0.33	0.00	-	0.00	-	0.00	-	0.33	3,887,378.50	0.00	-	**0.33**
4	24M01B003	3.00	2.66	0.67	11,233,250.00	0.82	13,592,232.50	1.03	17,126,212.95	0.00	-	0.00	-	**2.66**
5	24M01B004	4.00	0.49	0.00	-	0.00	-	0.00	-	0.00	-	0.53	5,822,096.87	**0.49**
6	24M01B005	5.00	2.28	0.00	-	0.00	-	0.00	-	1.01	11,961,164.60	1.27	15,130,873.22	**2.28**
7	24M01B006	6.00	0.78	0.00	-	0.00	-	0.00	-	0.00	-	0.77	9,210,096.74	**0.77**
8	24M01B007	7.00	1.18	0.00	-	0.00	-	0.00	-	1.18	14,054,368.41	0.00	-	**1.18**
9	24M01B008	8.00	0.21	0.00	-	0.00	-	0.00	-	0.00	-	0.23	2,730,135.82	**0.21**
			10.65	**1.62**	**22,466,500.00**	**1.75**	**24,713,150.00**	**1.87**	**27,184,465.00**	**2.51**	**29,902,911.50**	**2.81**	**32,893,202.65**	**10.65**
							C Class Roads							
10	24M02C024	1.00	3.55	0.58	7,221,375.00	0.76	9532215.00	0.70	8737863.75	0.77	9611650.13	0.71	8881164.72	**3.53**
11	24M02C029	2.00	1.59	0.61	7,221,375.00	0.99	11756398.50	0.00	0.00	0.00	0.00	0.00	0.00	**1.59**
12	24M02C041	5.00	0.50	0.00	-	0.00	0.00	0.50	5941747.35	0.00	0.00	0.00	0.00	**0.50**
13	24M02C049	6.00	2.28	0.00	-	0.00	0.00	0.00	0.00	0.88	9611650.13	1.39	15224853.80	**2.27**
14	24M02C057	4.00	2.74	0.58	7,221,375.00	0.42	5242718.25	0.70	8737863.75	1.04	13071844.17	0.00	0.00	**2.74**
15	24M02C063	3.00	10.09	0.60	7,221,375.00	0.43	5242718.25	0.96	11533980.15	0.51	6151456.08	1.51	18185242.04	**4.01**
			20.74	**2.36**	**28,885,500.00**	**1.75**	**31774050.00**	**0.70**	**34951455.00**	**0.77**	**38446600.50**	**0.71**	**42291260.55**	**14.64**

D Class Roads

16	24M02D109	1.00	4.34	0.00	0.00	0.00	0.00	0.00	0.00	0.57	6834951.20	0.79	9398057.90	**1.36**
17	24M02D159	2.00	1.93	0.54	6419000.00	0.59	7060900.00	0.65	7766990.00	0.14	1708737.80	0.00	0.00	**1.93**
			6.27	**0.54**	**6419000.00**	**0.59**	**7060900.00**	**0.65**	**7766990.00**	**0.72**	**8543689.00**	**0.79**	**9398057.90**	**3.29**
					64190000.00		**70609000.00**		**77669900.00**		**85436890.00**		**93980579.00**	
Total Length of Road, Km			**45.87**	***Total Length of Road to be Completed Within 5 Year in Km***										**31.43**

CHAPTER 8: CONCLUSION

The Municipal Transport Master Plan, prepared for Dhulikhel Municipality, is a critical component of the Integrated Urban Development Plan (Volumes 1-16).

The MTMP has identified, through research, that the transport network in Dhulikhel needs to provide mobility and access for pedestrians, cyclists, drivers and public transport users. The Transport network is a critical component and needs to respond to the strategic land use and development framework for the municipality, including providing access to and between settlements, markets and production and services.

The MTMP establishes a methodology (including criteria and road hierarchy) of assessing priority road projects to be undertaken by the Muncipality over the short, medium and longer term. A series surveys for data collection, series of different level interaction with the locals and various authorities was conducted. The study has identified all the roads of the Municipality, their status and interventions required. The map of IDPM, MIM, MTPP and other maps are prepared. Detail implementation strategy and budged expenditure plans have been prepared. The inventory shows that majority of roads are narrow as well as earthed and needs maintenance and upgrading. This is in line with the demand by the wards. The accessibility of roads has been found satisfactory though it needs to be increased. 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.

Importantly, the approach for managing transport is very different in the built-up areas, compared with the rural areas.

In the bazar areas, density is much higher and as infill areas continue to develop, priority will be given to pedestrians and cyclists with vehicles having a secondary and less dominant role, and some areas will be pedestrian only. A series of Community parking areas on the edge of the town will accommodate vehicles. In new residential and commercial growth areas, a similar approach will be taken. Roads will be narrower, ‘shared spaces’, compatible with the dominant mode of transport, walking.

In the rural areas, and areas that provide links between settlements, wider roads will be developed in accordance with the road categories and specifications. These roads will

be upgraded to facilitate public transport and freight vehicles, moving products from site to market.

Most of the roads were earthen one and people demand the upgrading of present road network for the betterment of their ward. Almost **291.64 Km** of road exists within the Municipality out of which **SRN (25.22 Km), DRCN (30 Km) and Other Roads (236.42 Km)**. Pedestrians have not been given proper consideration and little importance was given to enhance road safety. Most of the roads are narrow and poorly maintained and thus need to be upgraded. Public transportation, which has significant trip share lacks proper network and some wards still lacks accessibility to public transportation. Similarly, the construction of new roads and upgrading of present need to be based on interaction of local people and participation of local community is must for the effectiveness of the intervention.

Dhulikhel is popular for its scenic beauty. There are many more viewpoints and beautiful hills within the Municipality. The Municipality is adorned with lots of natural beauty and beautiful mountains, viewpoints, hills as well as fertile land in the Municipality, it has been playing a greater role in tourism sector for economic development. Proper land-use regulation and policy has to be formulated to achieve the vision that has been set by the Municipality.

The success of the MTMP will rely on:

- The consistent and disciplined design and delivery of infrastructure, year upon year.
- Careful and early masterplanning of developing urban areas including the location of transport infrastructure (parking, access network, public transport).
- Administration of by-laws that protect potential for upgrading transport infrastructure.
- Consistent processes to ensure integration between development and provision of infrastructure, including both through the development approvals process but also the implementation of land pooling.
- Application of design standards that apply universal access
- High standard of design and provision of transport infrastructure that supports universal access for pedestrians, cyclists and vehicles

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ANNEX A:
ROAD DEMAND FORM

ANNEX B:
MAPS

ANNEX C:
TYPICAL ROAD SECTION

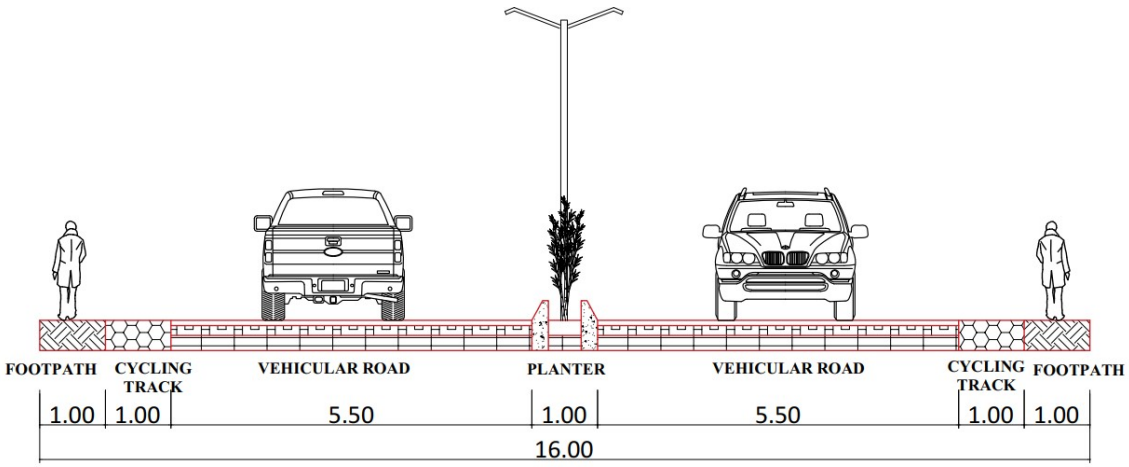

Figure 18: Class A Road

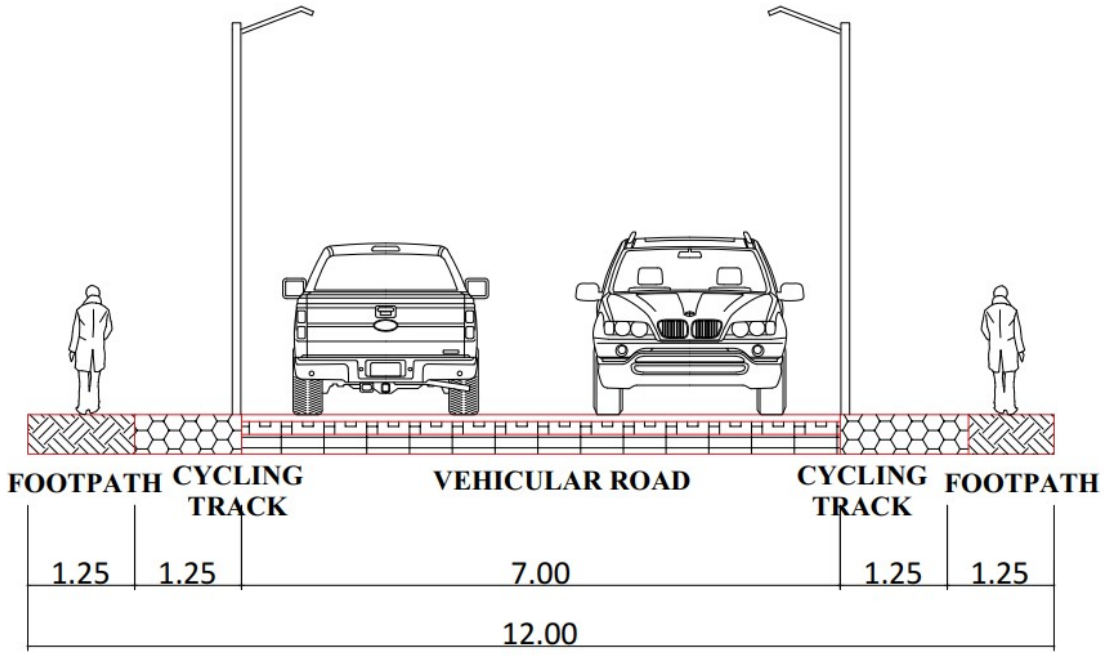

Figure 19: Class B Road

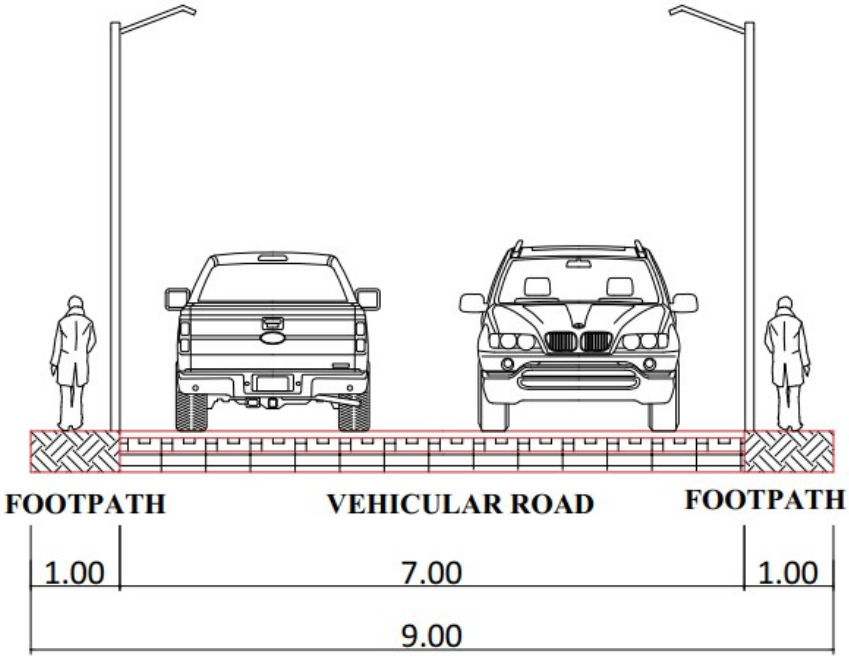

Figure 20: Class C Road

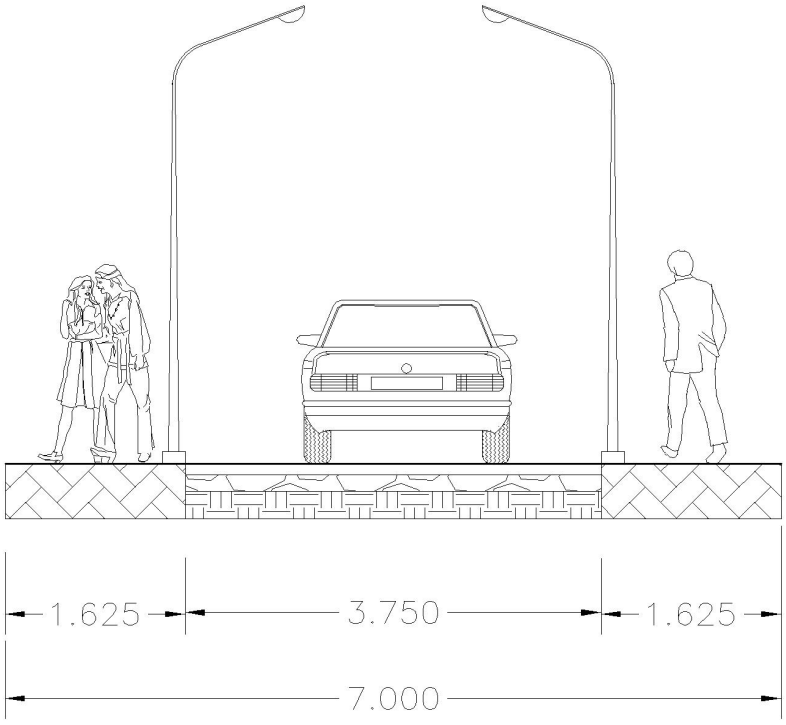

Figure 21: Class D Road

ANNEX D:
PHOTOGRAPHS

Figure 22: Road Condition

Figure 23: Ward Meetings

Figure 24: BP Highway

Figure 25: Junction of Araniko and BP highway

Figure 26: Road COnditions

Figure 27: Kali Mandir

ANNEX E:
SUMMARY OF CLASS "A, B, C and D" ROADS

LIST OF CLASS A ROADS (16 m. Right of Way)

S. No.	Municipality Code	NAME	Length (Km)	Ward Passed	Inter-vention
1	24M02A001	Chahare Khola - Dhulikhel Khola ko Pakha	6.46	1, 2	New
2	24M02A002	Punyamata Khola Corridor	1.75	5	New

LIST OF CLASS B ROADS (12 m. Right of Way)

S. N	Municipal Code	Name	Length (Km)	Ward Pass	Existing Width	Intervention	Surface
1	24M02B001	RTO Road Chaukot	2.72	12	12	Upgrade	Gravel
2	24M02B002	Biscute Factory - Hulak	0.33	12	9	Upgrade	Gravel
3	24M02B003	Lamichane - Kukelthumka	2.66	12	0	New	New
4	24M02B004	Devisthan - Dhulikhel picnic spot /	0.49	12	11	Upgrade	Bitumen
5	24M02B005	Bataasey BP highway - Bhattedaada	2.28	12	11	Upgrade	Earthen
6	24M02B006	Kaabre bhanjyang/Devisthan(old road) - Sukkha Pokhari	0.78	12	11	Upgrade	Earthen
7	24M02B007	Kaabre bhanjyang/Devisthan(old road)- Dhulikhel	1.18	12	11	Upgrade	Earthen
8	24M02B008	Laakuri bhanjyang- BP highway	0.21	12	10	Upgrade	Earthen
9	24M02B009	Hospital maarga	0.65	12	11	Upgrade	Bitumen

LIST OF CLASS C ROADS (9 m. Right of Way)

S N	Municipal Code	NAME	Length (Km)	Ward Pass	Inter vention	Existing width	Surface
1	24M02C001	Ting Khola - Kashi Bhyanjang	5.91	1	Upgrade	9	Earthen
2	24M02C002	Milan Chok - Bhadaure Danda - Anaikot	4.85	1	Upgrade	9	Earthen
3	24M02C003	Sano Tinghare road	2.80	<Null>	Upgrade	9	Earthen
4	24M02C004	<Null>	3.19	<Null>	Upgrade	9	Earthen
5	24M02C005	Chamare to 24DR012	2.04	<Null>	Upgrade	9	Earthen
6	24M02C006	School Danda -Ting Khola/Kashi Bhyanjang Road (School Danda - Chyaan Danda)	1.01	1	Upgrade	9	Earthen
7	24M02C007	Ting Khola/Kashi Bhyanjang - Chyaan Danda (School Danda - Chyaan Danda)	1.51	1	Upgrade	9	Earthen
8	24M02C008	<Null>	1.62	<Null>	Upgrade	9	Earthen
9	24M02C009	<Null>	1.45	<Null>	Upgrade	9	Earthen

SN	Municipal Code	NAME	Length (Km)	Ward Pass	Inter vention	Existing width	Surface
10	24M02C010	Lamatole to Devitar	0.85	<Null>	Upgrade	9	Earthen
11	24M02C011	Chyaan danda road	0.59	<Null>	Upgrade	9	Earthen
12	24M02C012	Chhahare danda road	0.57	<Null>	Upgrade	9	Earthen
13	24M02C013	<Null>	0.56	<Null>	Upgrade	9	Earthen
14	24M02C014	Pakucha - Domane (MTMP), Pakuchaa maarga	4.15	8	Upgrade	9	Earthen
15	24M02C015	Thakuri Guan Marga	3.20	<Null>	Upgrade	9	Earthen
16	24M02C016	Chaplati - Chamare	2.62	2	Upgrade	9	Earthen
17	24M02C017	Chaplati - Ward No 1	1.94	2	Upgrade	9	Earthen
18	24M02C018	Rabi - Deurali - Chamare	4.34	1	Upgrade	9	Earthen
19	24M02C019	Sisne Khola - Thini Gaun	0.73	2	Upgrade	9	Earthen
20	24M02C020	Naya Basti maarga /Bhandari gaaun maarga (Panchakanya - Chankubesi MTMP)	3.18	3	Upgrade	9	Earthen
21	24M02C021	Dhulikhal - Nagarkot (MTMP), Bajrayogini maarga	2.64	3	Upgrade	9	Earthen
22	24M02C022	Thaa daada maarga (Panchakanya - Kutal - Rabi -Chaplati - Chamare MTMP)	4.14	3	Upgrade	9	Earthen
23	24M02C023	Taasi chhabeyling maarga (Nayagaun Bato MTMP)	1.62	3	Upgrade	9	Earthen
24	24M02C024	Kuttal maarga (Dhulikhel- Devitar MTMP)	3.55	3	Upgrade	9	Gravel
25	24M02C025	Kuttal maarga	0.93	<Null>	Upgrade	9	Earthen
26	24M02C026	Gorakhnaath Marga	0.29	<Null>	Upgrade	9	Bitumen
27	24M02C027	Pipal bot Marga	0.23	<Null>	Upgrade	9	Bitumen
28	24M02C028	Navadurga maarga,Sohrakhuttey Maarga,tahagaaal maarga,Bhoomioath maarga (Dhulikhel - Gitamarg Hospital Chok - Takhusi- DMI - Shreekhandapur MTMP)	1.76	4	Upgrade	9	Bitumen
29	24M02C029	Agoharibaba Marga	1.59	4	Upgrade	9	Gravel
30	24M02C030	Pancha kumari Marga (Chukunepati - Bashghari MTMP)	0.62	4	Upgrade	9	Gravel

SN	Municipal Code	NAME	Length (Km)	Ward Pass	Inter vention	Existing width	Surface
31	24M02C031	Bukhhundol maarga ,Shreekhandapur - F07301 (Shreekhandapur - 28 Kilo MTMP)	0.61	<Null>	Upgrade	9	Gravel
32	24M02C032	Purkutitole - Muktimarga - Chaukot	0.44	4	Upgrade	9	Gravel
33	24M02C033	Bhoomipath maarga	0.40	<Null>	Upgrade	9	Bitumen
34	24M02C034	Bukhhundol maarga	0.71	<Null>	Upgrade	9	Bitumen
35	24M02C035	Nava shaanti maarga	0.23	<Null>	Upgrade	9	Bitumen
36	24M02C036	Chaukot maarga (Lankhanamai Mandir - Suwaltole MTMP)	1.57	6	Upgrade	9	Bitumen
37	24M02C037	Laayakoo Maarga (Punyamata Chowk - Thapaliya Chowk MTMP)	0.48	5	Upgrade	9	Gravel
38	24M02C038	Lasangu Maarga	0.28	<Null>	Upgrade	9	Bitumen
39	24M02C039	Bhairav maarga,Shreekhanda maarga	0.81	<Null>	Upgrade	9	Gravel
40	24M02C040	Punyamaata marga; (BP HW - Prakeshlibrary MTMP)	0.25	5	Upgrade	9	Gravel
41	24M02C041	Mukti maarga (Lakhana Mai Mandir-RTO-Mukti Marga MTMP)	0.50	6	Upgrade	9	Gravel
42	24M02C042	Geeta maarga (Dhulikhel -Gitamarg Hospital Chok - Takhusi- DMI - Shreekhandapur MTMP)	0.34	6	Upgrade	9	Bitumen
43	24M02C043	Baalkumari maarga (Lankhanamai Mandir - Suwaltole MTMP)	0.21	6	Upgrade	9	Bitumen
44	24M02C044	Ganesh maarga	0.31	<Null>	Upgrade	9	Bitumen
45	24M02C045	Ganesh maarga-Sindhuli Marga	0.15	<Null>	Upgrade	9	Bitumen
46	24M02C046	Siddha pokhari marga	0.10	<Null>	Upgrade	9	Bitumen
47	24M02C047	Dutol maarga	0.10	<Null>	Upgrade	9	Bitumen
48	24M02C048	Kaabre bhanjyang - Devisthan(old road), (Devisthan - Kavrebhanjyang MTMP)	1.77	9	Upgrade	9	Earthen

SN	Municipal Code	NAME	Length (Km)	Ward Pass	Inter vention	Existing width	Surface
49	24M02C049	Devisthan - Golden Buddha-Sanjibani bazar - Dhulikhel Campus - Adda Bazzar-Swarsati Bazar	2.28	7	Upgrade	9	Bitumen
50	24M02C050	Soopari taar Nagarpalika marga (Sanjabani school - Nagarpalika - Mainroad MTMP)	0.70	7	Upgrade	9	Bitumen
51	24M02C051	Hoorkha Marga (Swarsati Bazar - Hurkhamarg - BP MTMP)	0.62	7	Upgrade	9	Gravel
52	24M02C052	Gutuchha Marga (Dhulikhel Bus stop-Swarsati Bazar - Gutuchhamarga - BP HW MTMP)	0.62	7	Upgrade	9	Gravel
53	24M02C053	Eemaathey	0.53	<Null>	Upgrade	9	Bitumen
54	24M02C054	Hoorkha Marga (Swarsarsati Bazar - Thado Orolo - BP HW MTMP)	0.33	7	Upgrade	9	Gravel
55	24M02C055	Dhobhi khola-Lamsal gaau-Namo buddha sadak	0.26	<Null>	Upgrade	9	Earthen
56	24M02C056	Ananda Maraga	0.19	<Null>	Upgrade	9	Bitumen
57	24M02C057	Bagaichaa maarga (Khawa - Sikharkatari - Kalche MTMP)	2.74	8	Upgrade	9	Earthen
58	24M02C058	Sikhar katari - Lutel Gaun	1.66	<Null>	Upgrade	9	Earthen
59	24M02C059	Sallepani-Thulitar Road (Sikharkateri - Gangaram- Sallepani-Thulitar MTMP)	2.25	<Null>	Upgrade	9	Earthen
60	24M02C060	Swargehoomen Maarga	2.16	<Null>	Upgrade	9	Earthen
61	24M02C061	Chayyal Devi Marga (Thakle - Chapaladevi MTMP)	2.24	8	Upgrade	9	Earthen
62	24M02C062	Bhatte daada Marga (Pipalbot - Kavreybhyanjang MTMP)	3.94	8	Upgrade	9	Earthen
63	24M02C063	Raamche daada-Teen piple/Paatle khet - Teenpiple	10.09	11	Upgrade	9	Earthen
64	24M02C064	Paani tank-Deurali daada-Namo Buddha Road	0.60	<Null>	Upgrade	9	Earthen

S N	Municipal Code	NAME	Length (Km)	Ward Pass	Inter vention	Existing width	Surface
65	24M02C065	Ram Mandir to kalika devi mandir to 24DR018	1.56	<Null>	Upgrade	9	Earthen
66	24M02C066	Thumka sadak - Namobuddha Lodge Danda	2.91	12	Upgrade	9	Earthen
67	24M02C067	Bhairabghat - Thakurichhap	1.46	10	Upgrade	9	Earthen
68	24M02C068	Eklekhet - Fending	2.39	12	Upgrade	9	Earthen
69	24M02C069	Ite - Piple	2.45	12	Upgrade	9	Earthen
70	24M02C070	Sangkhupatichaur - Shree shankheshwori pra vi Namobuddha Municipality	2.05	<Null>	Upgrade	9	Earthen
71	24M02C071	Eklekhet to F07202 road	1.89	<Null>	Upgrade	9	Earthen
72	24M02C072	Sankheswari - Talloeklekhet	1.89	12	Upgrade	9	Earthen
73	24M02C073	Nayanpati to Saukotadanda	1.08	<Null>	Upgrade	9	Earthen
74	24M02C074	<Null>	1.06	<Null>	Upgrade	9	Earthen
75	24M02C075	Eklekhet road	0.73	<Null>	Upgrade	9	Earthen
76	24M02C076	<Null>	0.59	<Null>	Upgrade	9	Earthen
77	24M02C077	Ite/piple road to Lamichhane gaun	0.45	<Null>	Upgrade	9	Earthen
78	24M02C078	Sankhupati chaur to Ryale	0.45	<Null>	Upgrade	9	Earthen
79	24M02C079	Devisthan to Panauti	2.52	<Null>	Upgrade	9	Earthen
80	24M02C080	<Null>	0.26	<Null>	Upgrade	9	Earthen
81	24M02C081	<Null>	0.11	<Null>	Upgrade	9	Earthen
82	24M02C082	<Null>	0.20	<Null>	Upgrade	9	Earthen
83	24M02C083	<Null>	0.28	<Null>	Upgrade	9	Earthen
84	24M02C084	<Null>	0.27	<Null>	Upgrade	9	Earthen

LIST OF CLASS D ROADS (7 m. Right of Way)

S N	Municipal Code	NAME	Length (Km)	Ward Pass	Inter vention	Existing width	Surface
1	24M02D001	<Null>	3.07	2	Upgrade	7	Earthen
2	24M02D002	24DR009 - Sakhin Chaur Road; Chisapani - Sakhin Chaur (MTMP)	1.22	2	Upgrade	7	Earthen
3	24M02D003	<Null>	1.72	2	Upgrade	7	Earthen
4	24M02D004	<Null>	1.44	2	Upgrade	7	Earthen
5	24M02D005	<Null>	1.43	2,8	Upgrade	7	Earthen
6	24M02D006	<Null>	1.39	2,8	Upgrade	7	Earthen
7	24M02D007	<Null>	1.47	2	Upgrade	7	Earthen
8	24M02D008	<Null>	1.19	2	Upgrade	7	Earthen

S N	Municipal Code	NAME	Length (Km)	Ward Pass	Inter vention	Existing width	Surface
9	24M02D009	<Null>	2.29	2	Upgrade	7	Earthen
10	24M02D010	<Null>	1.11	2	Upgrade	7	Earthen
11	24M02D011	<Null>	0.80	2	Upgrade	7	Earthen
12	24M02D012	<Null>	1.00	2	Upgrade	7	Earthen
13	24M02D013	<Null>	0.59	2	Upgrade	7	Earthen
14	24M02D014	<Null>	0.59	2	Upgrade	7	Earthen
15	24M02D015	<Null>	0.56	2	Upgrade	7	Earthen
16	24M02D016	<Null>	0.50	2	Upgrade	7	Earthen
17	24M02D017	<Null>	0.48	2	Upgrade	7	Earthen
18	24M02D018	<Null>	0.47	2	Upgrade	7	Earthen
19	24M02D019	<Null>	0.39	2	Upgrade	7	Earthen
20	24M02D020	<Null>	1.26	2	Upgrade	7	Earthen
21	24M02D021	<Null>	0.45	2	Upgrade	7	Earthen
22	24M02D022	<Null>	0.35	2	Upgrade	7	Earthen
23	24M02D023	<Null>	0.29	2	Upgrade	7	Earthen
24	24M02D024	Deurali Buspark to 24DR009 (short path)	0.34	2	Upgrade	7	Earthen
25	24M02D025	<Null>	0.31	2	Upgrade	7	Earthen
26	24M02D026	<Null>	0.32	2	Upgrade	7	Earthen
27	24M02D027	<Null>	0.20	2,8	Upgrade	7	Earthen
28	24M02D028	<Null>	0.14	2	Upgrade	7	Earthen
29	24M02D029	<Null>	0.09	2,8	Upgrade	7	Earthen
30	24M02D030	24DR009 -Chisapani Road; Chisapani - Sakhin Chaur (MTMP)	2.09	2	Upgrade	7	Earthen
31	24M02D031	Dhulikhel Lodge resort to Shree Goshainkunda primary school	0.70	3	Upgrade	7	Earthen
32	24M02D032	<Null>	0.53	3	Upgrade	7	Bitumen
33	24M02D033	Naimisharanya kshetra road	0.50	3	Upgrade	7	Earthen
34	24M02D034	28 kilo bus stop to nilkantheshwor mahadev mandir	0.34	3,4	Upgrade	7	Bitumen
35	24M02D035	<Null>	0.77	3	Upgrade	7	Earthen
36	24M02D036	<Null>	0.27	3	Upgrade	7	Bitumen
37	24M02D037	Baasghaari Galli	0.16	3,4	Upgrade	5	Bitumen
38	24M02D038	<Null>	0.61	3	Upgrade	7	Bitumen
39	24M02D039	Pipalbot -Mukti Marga-Suwal tole - Buspark	3.49	6,7	New	0	New
40	24M02D040	<Null>	0.51	4	Upgrade	7	Bitumen
41	24M02D041	<Null>	0.49	4,5	Upgrade	7	Earthen
42	24M02D042	<Null>	0.32	4	Upgrade	7	Earthen
43	24M02D043	Nepal investment Bank Road	0.31	4	Upgrade	4	Bitumen

S N	Municipal Code	NAME	Length (Km)	Ward Pass	Inter vention	Existing width	Surface
44	24M02D044	KU road	0.46	4	Upgrade	4	Bitumen
45	24M02D045	Staff quarter track , KU cafe - KU silver jubliee stupa	0.14	4	Upgrade	4	Bitumen
46	24M02D046	Nepal Investment bank to Bhadraa Maarga	0.53	4	Upgrade	7	Bitumen
47	24M02D047	Shreekhandapur - 28 Kilo, Bukhundol Sidi	0.12	4	Upgrade	4	Gravel
48	24M02D048	Ratamate to Bhadraa Maarga	0.30	4	Upgrade	7	Bitumen
49	24M02D049	Rajendra Marga	0.10	4	Upgrade	7	Bitumen
50	24M02D050	<Null>	0.42	5	Upgrade	7	Earthen
51	24M02D051	<Null>	0.67	5	Upgrade	7	Earthen
52	24M02D052	Bhooka tol -Budool 11	0.24	5	Upgrade	7	Earthen
53	24M02D053	<Null>	0.23	5	Upgrade	7	Earthen
54	24M02D054	<Null>	0.22	5	Upgrade	7	Earthen
55	24M02D055	<Null>	0.73	5	Upgrade	7	Earthen
56	24M02D056	Chivaahaal east-Pustakalaya	0.19	5	Upgrade	7	Gravel
57	24M02D057	<Null>	0.32	5	Upgrade	7	Earthen
58	24M02D058	Shreekhandapur - Bhairab Mandir	0.13	5	Upgrade	7	Gravel
59	24M02D059	<NULL>	0.11	5	Upgrade	7	Bitumen
60	24M02D060	Punyamaata marga to Laayakoo Maarga	0.11	5	Upgrade	7	Bitumen
61	24M02D061	Laayakoo Maarga to Shreekhanda primary school	0.09	5	Upgrade	7	Bitumen
62	24M02D062	Laayakoo Maarga to Shreekhandapur - Bhairab Mandir road	0.08	5	Upgrade	7	Bitumen
63	24M02D063	Punyamata Road	0.08	5	Upgrade	7	Bitumen
64	24M02D064	<Null>	0.05	5	Upgrade	7	Bitumen
65	24M02D065	Narayan Mandir Road	0.05	5	Upgrade	7	Earthen
66	24M02D066	Korkhil Chowk - Bhairab Mandir- Ring road (MTMP), Kotkheel maarga	0.43	6	Upgrade	7	Earthen
67	24M02D067	Ganesh maarga to Dhulikhel Buspark	0.40	6,7	Upgrade	7	Bitumen
68	24M02D068	<Null>	0.38	6	Upgrade	7	Bitumen
69	24M02D069	<Null>	0.26	6	Upgrade	7	Earthen
70	24M02D070	<Null>	0.25	6	Upgrade	7	Earthen
71	24M02D071	<Null>	0.20	6	Upgrade	7	Bitumen
72	24M02D072	<Null>	0.12	6	Upgrade	7	Earthen
73	24M02D073	<Null>	0.10	6	Upgrade	7	Bitumen

S N	Municipal Code	NAME	Length (Km)	Ward Pass	Inter vention	Existing width	Surface
74	24M02D074	Purna sanjiwani lakhanamai Road	0.08	6	Upgrade	7	Bitumen
75	24M02D075	<Null>	0.07	6	Upgrade	7	Bitumen
76	24M02D076	<Null>	0.03	6	Upgrade	7	Bitumen
77	24M02D077	Geeta maarga to Siddha pokhari marga	0.02	6	Upgrade	7	Bitumen
78	24M02D078	Ghat Khola- Thulachaur , Raana chaaap-dhulikhel	1.10	7,9	Upgrade	7	Earthen
79	24M02D079	<Null>	0.50	7	Upgrade	7	Earthen
80	24M02D080	Kamal pokhari marga	0.22	7	Upgrade	7	Bitumen
81	24M02D081	Ganesh Mandir to Siddha pokhari	0.16	7	Upgrade	7	Bitumen
82	24M02D082	<Null>	0.03	7	Upgrade	7	Bitumen
83	24M02D083	<Null>	0.03	7	Upgrade	7	Bitumen
84	24M02D084	<Null>	0.02	7	Upgrade	7	Bitumen
85	24M02D085	Khawa - Swarsati ma v - Kavreybhyanjang (MTMP), Mane Gate- Swarasati ma vi - Khawa	3.58	8	Upgrade	7	Earthen
86	24M02D086	Dadelthok to Simirinkot	2.04	8	Upgrade	7	Earthen
87	24M02D087	Dadelthok road	1.07	8	Upgrade	7	Earthen
88	24M02D088	Kharka to Harithumli to Gaurabagh Road	1.38	8	Upgrade	6	Earthen
89	24M02D089	<Null>	0.22	8	Upgrade	7	Earthen
90	24M02D090	Lekadihi road	0.56	8	Upgrade	7	Earthen
91	24M02D091	<Null>	0.88	8	Upgrade	7	Earthen
92	24M02D092	<Null>	0.69	8	Upgrade	7	Earthen
93	24M02D093	<Null>	0.65	8	Upgrade	6	Earthen
94	24M02D094	<Null>	0.44	8	Upgrade	6	Earthen
95	24M02D095	Swarasati Ma v - Binayak	1.20	8	Upgrade	6	Earthen
96	24M02D096	<Null>	0.60	8	Upgrade	7	Earthen
97	24M02D097	<Null>	0.70	8	Upgrade	7	Earthen
98	24M02D098	<Null>	0.49	8	Upgrade	7	Earthen
99	24M02D099	Kampani- Terse - Khawa	0.68	8	Upgrade	7	Earthen
100	24M02D100	<Null>	0.45	8	Upgrade	7	Earthen
101	24M02D101	<Null>	0.57	8	Upgrade	7	Earthen
102	24M02D102	Dhanchare bagaincha- Kharani Danda	0.79	8	Upgrade	7	Earthen
103	24M02D103	<Null>	0.42	8	Upgrade	7	Earthen
104	24M02D104	<Null>	0.36	8	Upgrade	7	Bitumen
105	24M02D105	<Null>	0.33	8	Upgrade	7	Earthen
106	24M02D106	Sikharkateri-Dhokre Pakha	0.23	8	Upgrade	7	Earthen
107	24M02D107	<Null>	0.22	8	Upgrade	7	Earthen

S N	Municipal Code	NAME	Length (Km)	Ward Pass	Inter vention	Existing width	Surface
108	24M02D108	<Null>	1.19	8	Upgrade	7	Earthen
109	24M02D109	Majuwa Khola - Kavreybhyanjang - Thatithok (MTMP), Daarim bot Baal pra vi-B.P highway	4.34	9,11	Upgrade	7	Earthen
110	24M02D110	Humagain Tol-Koirala tole - Bachhala school; Maskate- Thulitar-Pipal thumki (MTMP)	1.54	9,11	Upgrade	6	Earthen
111	24M02D111	<Null>	1.05	9	Upgrade	7	Earthen
112	24M02D112	<Null>	0.88	9	Upgrade	7	Earthen
113	24M02D113	HulakiPati-Panitanki (MTMP), Paani Tank to farkot	0.67	9	Upgrade	7	Earthen
114	24M02D114	Daarim bot Road	0.62	9	Upgrade	7	Earthen
115	24M02D115	<Null>	0.59	9	Upgrade	7	Earthen
116	24M02D116	<Null>	0.75	9,10	Upgrade	7	Earthen
117	24M02D117	Birta-salle pani-Khaawa	1.89	8,9	Upgrade	6	Earthen
118	24M02D118	Daarim bot Baal pra vi-B.P highway	0.68	9	Upgrade	7	Earthen
119	24M02D119	Humagain Tol-Chhotey daada	0.92	9,11	Upgrade	6	Earthen
120	24M02D120	Faskot kaarki chaap -praa vi kaarki chaap paati chaur	0.37	9	Upgrade	6	Earthen
121	24M02D121	Paani tank - farkot	0.13	9	Upgrade	7	Earthen
122	24M02D122	Sunar Tole - Danda Gaun; Sunar Tole - Tinpiple (MTMP)	1.86	11	Upgrade	7	Earthen
123	24M02D123	Pipal Danda - Tinpiple ; Sunar Tole - Tinpiple (MTMP)	5.45	11	Upgrade	7	Earthen
124	24M02D124	Jukepokheri - Dobane	2.62	11	Upgrade	6	Earthen
125	24M02D125	<Null>	1.61	10,11	Upgrade	7	Earthen
126	24M02D126	Maskate- Thulitar-Pipal thumki	2.40	11	Upgrade	6	Earthen
127	24M02D127	<Null>	2.35	11	Upgrade	6	Earthen
128	24M02D128	Mathillo Pipalbot - Dhungeban	0.93	10	Upgrade	7	Earthen
129	24M02D129	<Null>	2.93	11	Upgrade	6	Earthen
130	24M02D130	Ping Danda - ite	0.38	10	Upgrade	7	Earthen
131	24M02D131	<Null>	0.66	10	Upgrade	7	Earthen
132	24M02D132	<Null>	1.34	11	Upgrade	6	Earthen
133	24M02D133	Heera Pasal - Naral Tole Road	1.23	11	Upgrade	6	Earthen
134	24M02D134	<Null>	0.65	11	Upgrade	6	Earthen
135	24M02D135	<Null>	1.67	11	Upgrade	6	Earthen

S N	Municipal Code	NAME	Length (Km)	Ward Pass	Inter vention	Existing width	Surface
136	24M02D136	<Null>	1.00	11	Upgrade	6	Earthen
137	24M02D137	<Null>	0.74	10	Upgrade	7	Earthen
138	24M02D138	<Null>	0.85	11	Upgrade	6	Earthen
139	24M02D139	<Null>	0.96	11	Upgrade	6	Earthen
140	24M02D140	<Null>	1.09	11	Upgrade	6	Earthen
141	24M02D141	<Null>	0.19	10	Upgrade	7	Earthen
142	24M02D142	Humagain Tol-Koirala tole - Bachhala school; Ramche Chaur - Daphe Khola (MTMP)	0.66	11	Upgrade	6	Earthen
143	24M02D143	<Null>	0.65	11	Upgrade	6	Earthen
144	24M02D144	<Null>	0.62	11	Upgrade	6	Earthen
145	24M02D145	<Null>	0.59	11	Upgrade	6	Earthen
146	24M02D146	<Null>	0.56	11	Upgrade	6	Earthen
147	24M02D147	<Null>	0.48	11	Upgrade	6	Earthen
148	24M02D148	<Null>	1.08	11	Upgrade	6	Earthen
149	24M02D149	<Null>	0.47	11	Upgrade	6	Earthen
150	24M02D150	<Null>	0.52	11	Upgrade	6	Earthen
151	24M02D151	<Null>	1.08	11	Upgrade	6	Earthen
152	24M02D152	<Null>	0.36	11	Upgrade	6	Earthen
153	24M02D153	<Null>	0.46	11	Upgrade	6	Earthen
154	24M02D154	Phulbari - Bhakunde Road	0.30	11	Upgrade	6	Earthen
155	24M02D155	<Null>	0.43	11	Upgrade	6	Earthen
156	24M02D156	<Null>	0.22	11	Upgrade	6	Earthen
157	24M02D157	<Null>	0.63	11	Upgrade	6	Earthen
158	24M02D158	<Null>	0.42	11	Upgrade	6	Earthen
159	24M02D159	BP HW - Sarada Batase - ite -Phaskot - Krisna Mandir	1.93	10,12	Upgrade	7	Earthen
160	24M02D160	<Null>	0.83	1	Upgrade	4	Earthen
161	24M02D161	<Null>	0.59	1	Upgrade	4	Earthen
162	24M02D162	<Null>	0.70	2	Upgrade	4	Earthen
163	24M02D163	<Null>	0.52	9	Upgrade	4	Earthen
164	24M02D164	<Null>	0.59	9	Upgrade	4	Earthen
165	24M02D165	<Null>	0.19	1	Upgrade	4	Earthen