



Government of Nepal

Ministry of Local Development

Department of Local Infrastructure Development and Agricultural Roads (DoLIDAR)

**INTERIM GUIDELINE
FOR
DISTRICT TRANSPORT MASTER PLAN
(DTMP) PREPARATION**



May 2010

Foreword

An Approach Manual for the Development of Agriculture and Rural Roads was prepared in 1999, 11 years ago. When manual was prepared, most of district's priority was mainly for planning of new roads as there were less existing roads. During this period most of the districts, except few mountain roads built numerous roads. Now, all the *Terai* districts have constructed the required roads; they now need proper maintenance, rehabilitation and upgrading. Most of the hill districts have also initiated/constructed the roads which are mostly incomplete or under construction. These roads need to be completed and then go for maintenance, rehabilitation and upgrading.

Therefore the focus of rural transport infrastructure (RTI) planning needs some shift and updating. Planning process needs more effort on proper inventory of existing roads, using available technology (GPS for field data and GIS mapping, for maintaining and updating of the status of the existing roads systematically. Road condition survey is to be conducted as majority of roads in hills are not operational or impassable. Transport planning process has to be harmonised in line with national transport policy of bringing the population within 2 hour walking distance in *Terai*, 4 hours in hills and 6 hours in mountain districts. Existing planning process for new network was based on demands from VDCs, which was more focussed on VDC level interest rather than district perspective. RTI is to be defined, accommodated and re-classified. Government and donors have to look into the investment perspective in line to bring the impassable road to operational condition focusing at the same time to improve the accessibility of the people.

Sector Wide Approach (SWAp) is introduced for rural transport infrastructure. Seven donors -ADB, WB, DFID, SDC, GTZ, JICA, and WFP supported the approach and reached the understanding on February 2008 to start the SWAp from 2011 onward. SWAp basic principles are leadership of government, uniformity in process, planned development, joint funding, quality assurance and monitoring of sector wide achievement. For the implementation of RTI SWAp seven districts (Jhapa, Morang, Sankhuwasabha, Sindhupalchowk, Parbat, Dailekh and Dadeldhura) are selected for piloting the approach.. DTMPs of these districts are hence to be prepared first for the implementation of the approach in these pilot districts. Some other RTI projects e.g. RAIDP, RRRSDP are also initiating to review and update the DTMPs of the project districts.

With the present context of RTI scenario, updating of DTMP preparation process is required. DFID came forward to support for the updating of the RTI planning process and preparation of DTMPs of seven pilot districts. DFID through Rural Access Programme (RAP) entrusted the assignment of updating DTMPs in seven districts and updating approach manual to HELVETAS NEPAL. For all these initiatives, I express my sincere thanks to DFID Nepal, RAP and Helvetas Nepal for their financial and technical supports. I would also like to express my thanks to the individuals within and outside of Government of Nepal, who were instrumental in preparing this Interim Guideline. To name some are Mr. Bhupendra B. Basnet, DDG, DoLIDAR, Mr. Sushil Tiwari, SDE, DoLIDAR, Dr. Chandra Shrestha, Infrastructure Adviser DFID, Surendra G. Joshi, World Bank Nepal, Mr. Shiva P. Aryal Country Programme Director, HELVETAS NEPAL, Adhir Sharma, Deputy Country Programme Director, HELVETAS NEPAL and DTMP team members Mr. Hare Ram Shrestha, Team Leader, Mr. Umesh K. Shrestha, Socio-Economist. Participants of the workshop from donor community and Government of Nepal who provided their valuable comments and feedback deserve special thanks for their contribution in streamlining the updating of this Interim Guideline.

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Executive Summary

District Transport Master Plan is a reflection of transport infrastructure situation and future need in relation with the resources of the District. DTMP should be prepared basically adopting active participation for consensus building among all actors of the society. It strongly advocates for meaningful participation in the planning process to make DTMP more acceptable and creating ownership. The preparation process of DTMP pursues series of techno-political interface in the form of consultation workshops and interacting meetings to increase participation of all stakeholders such as District level workshop, DTICC meetings and cluster of *Ilaka* level workshops, formal/informal meeting and interaction, focus group discussions and transit walk, etc. In every stage, emphasis will be given on their access and high level of participation of different actors of society (i.e. representatives from line agencies, major political parties, social leaders, women organizations, *Dalit* and *Janjati* coordination committee, differently able people, chamber of commerce, transportation association) and work toward consensus building.

The normal period of DTMP is for five years. The given time frame should be strictly followed by DDCs in order to achieve its targeted plan on time. Although the Five Year Master Plans need to be developed on the basis of projected GON funds, the Government should follow a principle of allocating its resources according to the previous performance of the individual DDCs. The scale of rural transport infrastructure development in the districts would highly depend on the commitment shown by the each DDC, financial resource availability and their capacity.

This approach would certainly guide all the DDCs in preparing their own plans to address the needs of the communities in the districts. It would further provide them with the orientation required for the implementation of these plans while displaying the involvement of the most efficient combination of both public and private sectors, and keeping in line with respecting decentralization mechanism.

The various actions of this approach comprise the process of planning. Under this approach, the preparation of the District Indicative Development Potential Map, which clearly indicates the existing growth centres (market canters) and the areas having various development potentials (agriculture, horticulture, livestock's, high value crops, agro-based industry, tourism, hydro power, NTFP/MAPS, etc.) play a vital role.

District Inventory Map of the existing rural transport infrastructures is prepared using the GPS data (tracking of alignment and way points of all existing or potentially required major road structures and trail bridges). Rural Transport Infrastructure Network is overlaid on the IDPM. Accessibility map is prepared using GIS model to locate the inaccessible areas where the development interventions are required.

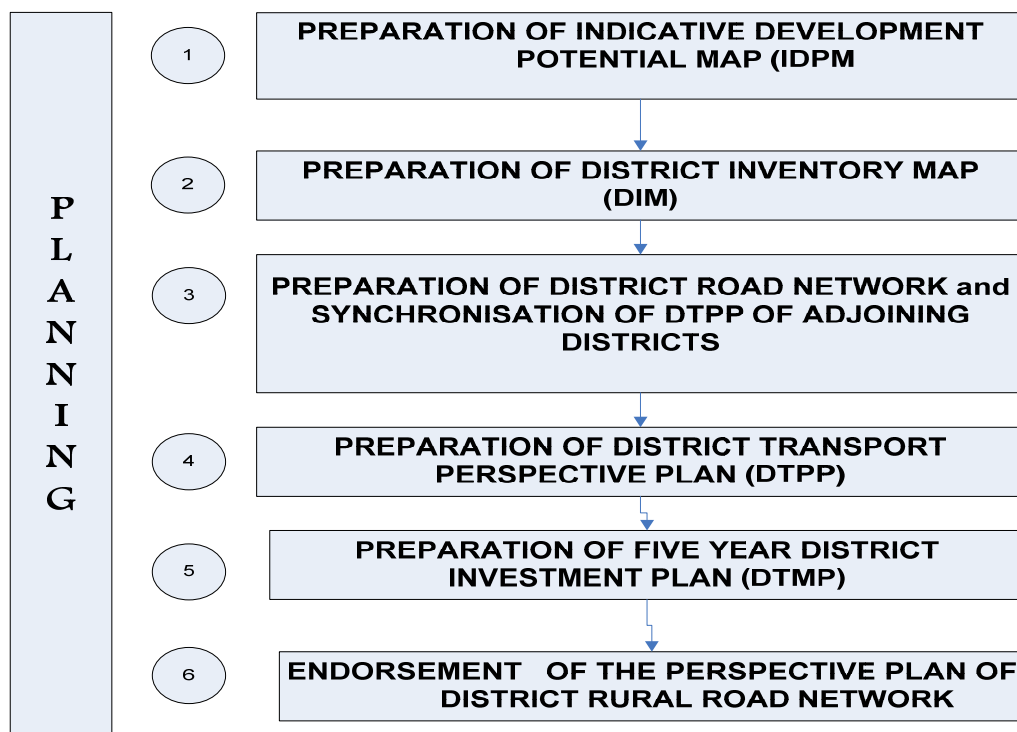
New network is planned in the inaccessible area based on the national transport policy (2 hours for *terai*, 4 hours in hills and 6 hours in mountain). District Transport Perspective Plan (DTPP) is prepared as total RTI requirement of the district. Total RTI requirement is prioritised and ranked based on the parameters of population, cost, cultivated land and deprived ethnic population for new transport linkage. For rehabilitation, parameters are existing traffics, cost and centrality index of the existing and potential growth centres along the road corridors. For upgrading of transport linkage parameters are projected traffics, cost and centrality index.

Then Five Year Projected Financial Plan is prepared by considering all possible funding sources (DDC development grant, VDC allocation, funds of Members of Parliament, DDC's and VDC's own resources, donor-funded project funds, etc.). Depending on the availability of resources (Human resources and fund availability etc.) and the anticipated work load, one DDC may achieve the targets

of the Perspective Plan in 15 years while another may take 25 years for the same. Therefore, the preparation of Five Year Plan is essential in order to address the highly prioritized RTI needs in line with the available resources. The Five Year Rural Transport Infrastructure Master Plan is a prioritized abstract of the Perspective Plan. Every five years, the DDC should review and revise the perspective plan. DDC could go ahead with the required revisions if the district development potentials and priorities are changed significantly.

It should be done just before the preparation of master plan for the second term. It is very important and clear that DDC can't take up any project other than that from the Master Plan after the plan is approved by the District Council. The approval of Master Plan ensures that a common consensus is reached among all participating VDCs regarding the selection of rural road sub-projects for the next five-year term. Five Year Rural Transport Infrastructure Master Plan which is referred as 'District Transport Master Plan (DTMP)' could be prepared coinciding with the five-year tenure of District Council.

Figure 1 : Planning Process for DTMP Preparation



List of abbreviations

AADT	: Annual Average Daily Traffic
ADT	: Average Daily Traffic
DADO	: District Agriculture Development Office
DDC	: District Development Committee
DFO	: District Forest Office
DIM	: District Inventory Map
DoLIDAR	: Department of
DOR	: Department of Roads
DRCC	: District Road Coordination Office
DTICC	: District Transport Infrastructure Coordination committee
DTMP	: District Transport Master Plan
DTO	: District Technical Office
DVO	: District Veterinary Office
ECA	: Cost Efficiency Analysis
ECBR	: Economic Cost Benefit Ratio
EIRR	: Economic Internal Rate of Return
ENPV	: Economic Net Present Value
GIS	: Geographic Information System
GON	: government of Nepal
GPS	: Global Positioning System
Ha	: Hectare
IDPM	: Indicative Development Potential Map
Km.	: Kilometre
LSGA	: Local Self Governance Act
MAP	: Medicinal and Aromatic Plants
MOC	: Moving Observers Count
NGO	: Non-Governmental Office
NMT	: Non-Motorised Transport
NRRS	: Nepal Rural Road Standard
NTFP	: Non-timber Forest Product
PCU	: Passenger Car Unit
PRRA	: Participatory Rapid Rural Appraisal
RRA	: Rural Road Class A
RRB	: Rural Road Class B
RTI	: Rural Transport Infrastructure
TBSU	: Trail Bridge Support Unit
TU	: Traffic Unit
VDC	: Village Development Committee
WDO	: Women Development Office
ZOI	: Zone of Influence

CHAPTER ONE: INTRODUCTION

1.1 Rationale for Modification in DTMP preparation Process

Approach Manual for 'Rural and Agricultural Roads' was prepared in 1999, which has provision for the preparation of District Transport Master Plan. The approach manual consists of various steps for preparation of DTMP as; VDC data collection, ranking of growth centres, scoring, prioritization, preparation of perspective plan of rural and agricultural roads including district road, village road, main trail and village trail and road coding. At present context, requirement and condition of RTI sector have already been developed. It has been realised that some steps mentioned in manual are to be modified. During the implementation of this approach for preparing DTMP, it has been found that there are some complexities in planning process such as networking method and prioritization process which are to be updated to accommodate the change. During the interaction with different professional and practitioners, following issues were identified:

- Present impression of the DTMP is like a wish list of district people, which should be avoided and number of roads to include in DTMP should be matched with the available resources.
- DTMP should focus on district level roads. Smaller roads initiated by VDCs could be covered in village level planning e.g. VTMP.
- GPS based information are lacking, it should be adopted for acquiring the alignment of existing roads.
- Status of rural roads is not clearly defined, which has created confusion for providing the maintenance fund for rural roads. Therefore, DTMP should clearly mention the status of road. Additional information to collect are:
 - surface types,
 - traffic status (pedestrian, 2 wheeler, bus, trucks and others),
 - status of all weather or fair weather,
 - construction status (track, middle width, full width)
 - Adequacy of bypasses.
 - Bridges/culverts required with location
 - Drainage and other features
 - Other improvements required (slope stability etc.)
- Bridge inventory is lacking it need to be included in the DTMP. Bridges are required for upgrading the roads from fair weather to all weather.
- VDC demands are influenced by local level interest within VDC boundaries, does not fit in district level requirement. It is to be planned in line with national transport policy and discuss in cluster of *Ilaka* Level workshops.
- Network planning should be linked with important market/service centres (nodal points).
- Identify the bridge requirement for existing roads, propose motorable suspension bridge, ferry etc.

1.2 Preparatory Activities

The Study team should carry out the preparatory activities prior to field level activities. The major activities are as follows:

- **Coordination with DDC/DTO**

The Study team should maintain close coordination with DDC and DTO in every activity such as to organize workshop, selection of field research team and their, mobilisation, etc. besides this; team should conduct an extensive consultation with various persons and agencies like different line agencies, NGOs INGOs and businessperson for secondary information.

Formation of District Transport Infrastructure Coordination Committee (DTICC)

The DTICC is an authorized legislative body; it plays an advisory role in formulating policies related to planning and construction of RTI. DRCC in the existing term should have been formed in every district, needs to be reformed according to the DoLIDAR's recent guidelines. If DRCC do not exist in the district, DTICC is to be formed composing as follows:

SN	Official	Designation
1	DDC Chairperson	Chair person
2	DDC Vice-Chairperson	Vice- Chairperson
3	Chairperson of Infrastructure Development Committee (Formed according to LSGA 2056, Cl. 193) among the DDC member	Member
4	Female Member of DDC (Nominated by DDC)	Member
5	Female, poor community and deprived community from each illaka among the chairperson of VDCs (nominated by DDC)	Member
6	Representatives from the major political parties of the district (Nominated by district level party committee)	Member
7	Representative from the NGO Federation (Nominated by NGO Federation)	Member
8	Representative from District level organisation of Janjati, Aadibashi, Female and Dalit formed by GoN	Member
9	Representative from the District Chamber of Commerce	Member
10	Representative from the District Transport Entrepreneur Association	Member
11	Chief of Division Road Office (DoR) responsible for the District	Member
12	Chief, District Technical Office	Member
13	Local Development Officer	Member-Secretary
14	Invitees Member of Parliament, Chief District Officer, line agencies chiefs - Agriculture Office, Women Development office, Soil Conservation office, Land Revenue office, Irrigation office, water supply office, Education office, Forest Office, Health office, Electricity Authority, Cottage Industry Office, Survey Office, District Cooperative office) and Project Mangers of transport infrastructure projects in the district (invitation as required)	Member

Note:

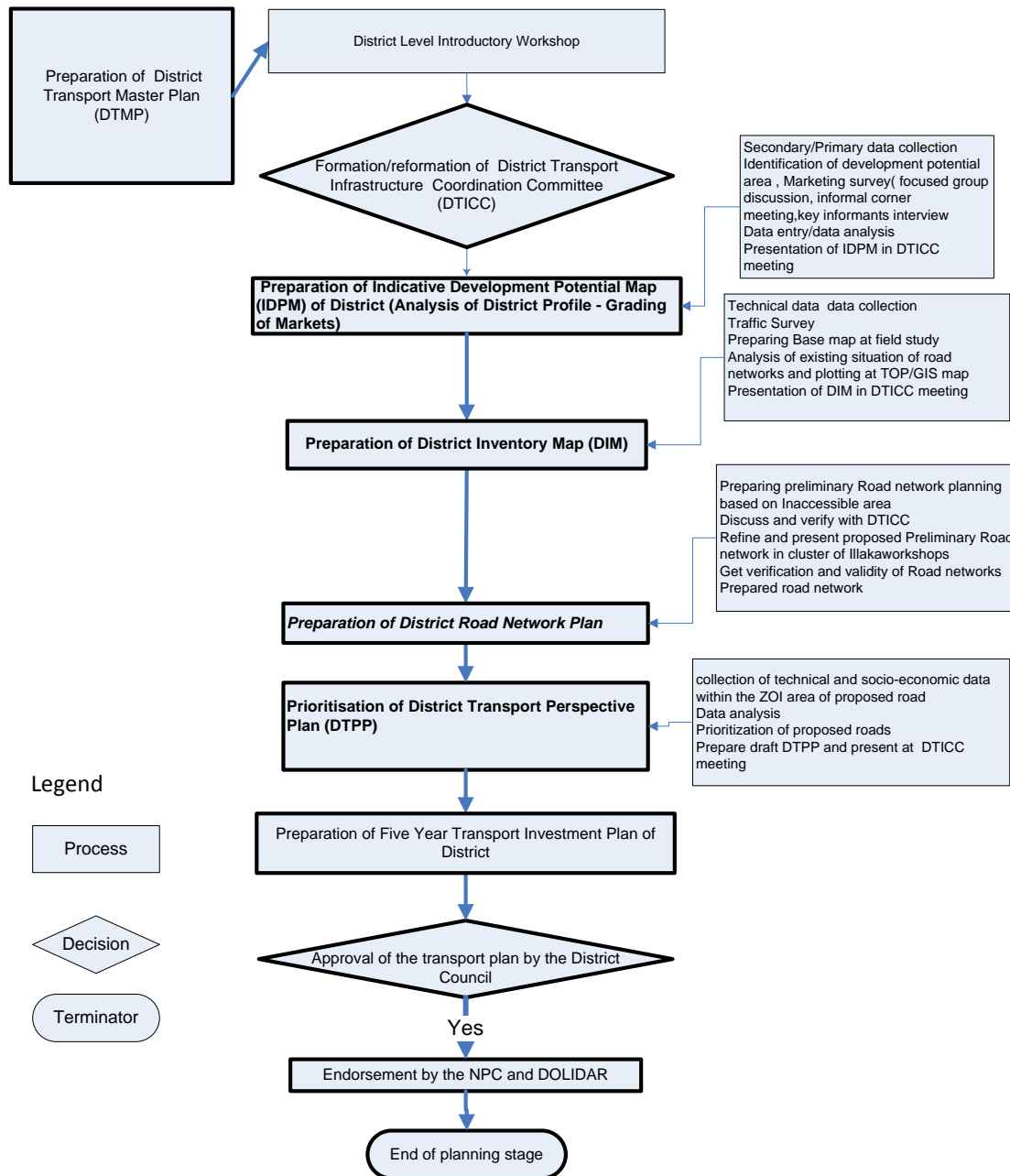
At present, in the absence of elected body, joint committee named as '*Sanyantra*' comprising of the representative of political parties existing in the respective districts is functioning as DDC body. LDO is functioning as DDC Chairperson and no provision is made for DDC Vice Chairperson. Party representatives of the joint committee (*Sanyantra*) are the members of the DDC.

District Level Introductory Workshop for Techno-political Interface

One day district workshop is organized by the DDC, to start the planning works and to have techno-political interface with representatives of political parties. DTMP preparation/updating process is explained. This ensures the participation of political leaders in the planning process, so that DTMP could be accepted by the district as their own documents. Participants of the workshops are representatives from line agencies, major political parties, VDC secretaries, media people, NGOs, social leaders, women organizations, dalit and Janjati coordination committee, differently able people,

chamber of commerce, transport entrepreneurs association. Planning team should explain about objective of DTMP, its importance, process and methodology of DTMP preparation. DTO presents the existing RTI situation of the districts. Comments and feed backs are collected from the participants.

**FLOW DIAGRAM
DTMP Planning Process and its Methodology**



CHAPTER TWO: PREPARATION OF DISTRICT INDICATIVE POTENTIAL MAP

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

While preparing, IDPM techno-social interface takes place with interaction with the community of market/nodal centres and the people along the road corridor. Information is gathered from the local people.

2.1 Data/ Information collection

Secondary data are collected from annual report published by district level offices and consultation with stakeholders (such as DADO, DVO, DDC, DEO, WDO, DFO, Small Cottage Industries and local business entrepreneurs, etc).

Field study is carried out for general socio-economic assessment of the district. During the field study, data are collected from primary and secondary sources by using PRRA and consultation methods. data/information regarding area, location and significance of development potential areas such as extensive agriculture, extensive horticulture, livestock farming, high value cash crops, cottage and agro-based industries, centre for business/commerce/markets, tourism area, hydropower and water mills, mining area, service centres e.g. hospital, health post, agriculture service sub-centre etc are collected from annual report, district profile, study report published by various offices such as DDC, DADO, District Education office, Small and Cottage and Industries, local business person etc .

The information about demographic data of district, maps, service flow pattern, various maps showing service centres or the location of SOR (Service of Road) facilities, transport infrastructure inventory, past plans and sector study reports, sector standards and policy targets are collected from the secondary sources - Bureau of Statistics, Kathmandu, Survey Department, Local NGOs, line agencies, DDC, etc. The questionnaire is given in annexes.

2.2 District Base Map Preparation

District Base Map is prepared in 1:25,000 scales or in 1:50,000 scale (preferably in 1:25,000 scale if topographical map of the same scale is available) of hardcopy topographical sheet adding features of IDPM and DIM. The Base Map should show:

- VDCs/Municipalities with their boundaries;
- Large settlements;
- National strategic roads, existing district roads and trails;
- Important water bodies (rivers, lakes, etc.); and
- Important historic and religious places.

2.3 Traffic Survey

Moving Observer's Count

Traffic count surveys are conducted to record the level of use of a road, as well as to classify the vehicles by type. The main output from a traffic count is a measure of average traffic flow, recorded as the total traffic passing in both directions over a 24 hour period (the Average Daily Traffic or ADT). Traffic counts on low volume rural roads should also include pedestrians, bicycles and other non-motorised means of transport (NMTs). Local knowledge should also be used to pick appropriate locations for conducting the traffic counts to ensure a true reflection of the traffic using the road to avoid under or over counting. Factors to look for, includes:

- Avoid counting too close to towns and villages
- Be aware of the location of junctions and the impact of these on traffic flows
- Pedestrians and NMT's may use local footpaths and tracks in addition to the road.

When counting this type of traffic ensure that the count station is located to capture all traffic

- Rural people predominantly travel as the sun is rising and as the sun is setting
- When counting in the wet season, need to have knowledge of local diversions on poor roads

Considering limitation of timeframe, Moving Observer Count (MOC) method has been proposed to conduct traffic survey. The survey can be executed at any location of a particular road section but should last at least one hour. A traffic survey form is used for MOC surveys. Utilizing the traffic survey form, the different types of vehicles need to be put into three different categories: (a) vehicles travelling in the opposite direction (x); (b) vehicles overtaking observer (y); and (c) vehicles overtaken by the observer (z). Following will then be the hourly traffic in both directions (HT):

$$HT = (x + y - z) / t$$

To convert the hourly flow into daily flows, following formula normally applies:

$$DT = 16 \times HT$$

Where,

HT = hourly traffic

x = vehicles travelling in opposite direction

y = vehicles overtaking the observer

z = vehicles overtaken by the observer

t = time in hours

DT = Daily traffic

Participatory Rapid Rural Appraisal

PRRA tools could be used for gathering information on traffic counts for very low volume rural roads. For the case of Nepal, vehicular movement in Nepal is extremely low at the range of 5 to 30. People and shopkeepers of the road corridors know the exact numbers of vehicle plying in the road. Numbers of rural roads undertaken by DDCs are too many. Moving Observers' Count (MOC) require one day for one road. In that case, traffic counts of all the roads in the district for the DTMP planning purpose needs more technicians. Almost two months may require for two technicians to take the traffic counts and inventory of existing roads with GPS tracking of alignments and waypoints recording of the road structures. Therefore, PRRA is another tool to gather the traffic counts asking the local people and shop keepers.

2.4 Market Survey

Market Survey is carried out to identify market and service centre. Data and information collected in the field is the main basis for determining the importance on relative importance of market/service centre and central places. All services existing in a particular centre are listed by the district line agencies and supplemented by more detailed field data such as economic population structure collected for the centre itself and its influence area, by means of P-RRA approach. For evaluation purpose, data from offices, Industry, Business & Commerce, Education, Health, Communication, Electricity Supply, Drinking Water Supply services are combined for the centre and its influence area. Assessment of economic facilities and services existing in the market/service centres and their catchments areas leads to the identification of the most important market/service centre. Centrality analysis of the market facilities and government services are carried out.

The Centrality Index is calculated using following formula

$$C_j = \sum_{i=1}^n (W_i X_{ij})$$

Where,

C_j = Centrality Index of the j^{th} market centre

X_{ij} = value of the i^{th} function (number of establishments or shops at the j^{th} market centre)

W_i = Weightage of the i^{th} function

The weight of each function was calculated by adopting the Median Threshold Population Technique. The Median Threshold Population Technique calculates the weight as:

$$W_i = \frac{\text{Median population of the } i^{\text{th}} \text{ function}}{\text{Lowest median population of the market centres where a function exists}}$$

Weightage are assigned to different type of economic facilities and governments services and they are then aggregated. Based on the centrality index, the market centre should be categorized as first grade, second grade, and third grade market/Service centres. Graded market centres are plotted in GIS based district map.

Market is graded and this shall be the basis for network planning in the inaccessible area, rehabilitation and upgrading of existing roads.

The whole Transport Network Planning depends on hierarchy of market/service centres, so the market survey should be conducted more cautiously

2.5 Preparation of Indicative Development Potential Map.

The collected information is plotted on the base map indicating their geographical boundaries as accurately as possible. Base map on which all the development potential areas and sites are plotted is the draft Indicative Development Potential Map (IDPM) of the district. Brief notes on each plotted area of development potential are prepared. The description should highlight the nature and size of the area.

2.6 Presentation of IDPM in DTICC meeting to Finalize and approve IDPM

DDC arrange one day DTICC meeting in District Headquarter. All the members of DTICC members are invited in the meeting. The IDPM and the corresponding brief notes are presented to the DTICC with the help of base map. Plenary discussion will be encouraged to verify the information, get their comments and suggestion and appreciate their concern to get ownership. Their inputs will be incorporated for finalising IDPM, and then get approval from DTICC.

CHAPTER THREE: PREPARATION OF DISTRICT INVENTORY MAP (DIM)

Now, with numerous roads under construction, thrust is to prepare the DIM while preparing the DTMP. Most of the districts have excavated many roads though; most of the roads are in incomplete stage. In national context almost two third of roads are not operational to vehicle.

Thus it is necessary that before planning the network of rural transport infrastructure, the accurate information on the existing road and trail network should be collected. Using the prescribed formats, with all desired attributes of the roads and structure like length, width, condition, surface of the roads, etc. should be collected. The following activities are carried out for preparation of DIM Report.

3.1 Information collection

Information about the existing rural roads, main trails and trail bridges are collected from secondary information like DDC profile, Trail Bridge inventory of TBSU publication, RTI information available in DTO/DDC, previous DTMP report and recent TBSU information.

3.2 GPS Tracking/Inventory Survey of RTI

The inventory survey of the existing rural roads are carried out and required interventions; new construction, rehabilitation, periodic maintenance, regular maintenance are identified based on the field data. Earlier, spatial information of existing roads was taken on photocopy of topographical maps. Now, the information and data on existing rural infrastructure are to be taken by Global Positioning System (GPS) instruments including GPS tracking of existing trail bridges conducted by TBSU. GPS tracking is the major work for DIM preparation, which takes considerable effort in field level.

Information on surface type, traffic status, status of passability, status of construction, adequacy of bypasses, existing bridges and requirement, status of drainage and other improvement required are to be collected during inventory survey. In many of the existing roads, technical aspect (road geometrics) is grossly overlooked. Excessively high gradient prevents smooth plying of vehicle even during fair weather. This aspect is to be covered in the DIM for the planning investment of the rehabilitation of the road.

3.3 Preparation of DIM

Road alignment of existing roads, main trails, trail bridges and other RTI are plotted in the map. All the information related to the existing roads is plotted in the map. Major features and status of the existing roads showing the vehicle operational length, completed section of roads, section of roads under-construction etc. should be indicated in the map. These features are plotted in using GIS. GPS data of road alignment could be directly uploaded to the computer and then to GIS format. GPS locations (waypoints) of various structures (cross drainage – bridge, culverts, causeways and other major structures) are also plotted in GIS based map.

After plotting the existing operational roads, accessibility situation of the district is analysed. Analysis should base on the national transport policy of 2 hours in Terai and 4 hours in hills and mountains. Based on the DIM, required interventions are finalized for maintenance, rehabilitations and upgrading of the existing rural roads.

3.4 Presentation of DIM in DTICC meeting to Finalize and approve DIM

DDC should arrange one day DTICC meeting in District Headquarter. All the members of DTICC are invited to participate in meeting. District Inventory Map should be presented and discussed on the DTICC meeting. This will help DTICC members to understand the existing accessibility situation of the district. Discussion is made to collect their views, comments, suggestions for better transportation management. Their inputs will be anticipated in finalising the DIM, then get approval from DTICC.

Conditions of existing roads are categorised as good, fair, and poor. Estimate of rehabilitation cost and upgrading cost is based on the status of existing roads.

Presentation of DIM and IDPM is done in the same one day meeting with DTICC. Thus this meeting will have two main agendas – finalisation of IDPM and DIM.

CHAPER FOUR: PREPARATION OF DISTRCT NETWORK PLAN

Rural Transport Network should be theoretically sound and practically applicable. Rural transportation mainly deals with providing accessibility to the abutting people, mechanizing and commercializing the agriculture, promoting the non-farm sector and providing the extension and administrative services to the local people. In the context of Nepal, A fixed point system model is adopted for networking where junctions are confined to a finite set of location (market, historical location)

4.1 Prepare GIS map of nodal centres

- Prepare GIS map of nodal centres (according to the grading of market centres)
- Market centre are graded based on centrality index; Market grade A (> 100), grade B (50-100), grade C (25-50), and potential (< 25).
- All the market centres based on their hierarchy lies core of the central place and plotted in GIS map.
- After plotting all market centrals, all the existing roads are overlaid on the GIS Map.

4.2 Delineation of Accessible area

Accessible area according to National Transport Policy of 2 hours and 4 hours is delineated. Accessibility situation on the basis of national transport policy is analysed using GIS model. To delineate accessible area, isolines are constructed around market centres based on the availability of road, mode of transport and geographical condition. Buffering along the left and right of the existing all weather road is done on the basis of walking distance of 2 hours in *terai* and 4 hours in hills. These delineated areas are considered as accessible area.

4.3 Delineation of inaccessible area

Delineation of inaccessible area according to National Transport Policy of 2 hours Joint committee comprising of the representative of political parties existing the respective districts is functioning as DDC body 4 hours

After delineating the accessible areas, the un-served areas which are beyond the Zol (as per national transport policy) is taken as inaccessible area. The planning team proposes the road network for the inaccessible area delineated by the Zol analysis.

4.4 Preliminary road network plan for inaccessible area

Preliminary road network plan for inaccessible area is prepared based on the nodal points/market centres and national transport policy of 2 hour and 4 hours. Rural roads are categorized into two type of roads i.e. district road and village road. District road also functionally is two types, here for DTMP; district level roads are included for detail analysis. Road connecting major growth centres (Market Centre) are categorised as follows:

A. District Road Class 'A' (RRA) - DISTRICT ROAD-A

- Market Grade A to Market Grade A
- Market Grade A to Market Grade B
- Connecting more than three VDC/service centres
- Linking Market Grade A with high way , feeder road or RRA
- All rural roads which connect one or more major Growth Centres (market, tourism centre, industry, etc.) or several VDCs with the headquarters of the same/neighbouring district,
 - ⇒ directly or
 - ⇒ Through the National Strategic Road Network.

B. District Road Class 'B' (RRB) - District Road-B

- Market Grade A to Market Grade C
- Market Grade B to Market Grade C
- Connecting more than one VDC/service centres
- Linking Market Grade B or C with any other linkage
- All rural roads which connect a Village Development Committee Centre (VDC) with any one of the following:
 - ⇒ another VDC Centre
 - ⇒ National Strategic Road Network
 - ⇒ district road
 - ⇒ A major Growth Centre of the same/neighbouring district.
- All rural roads which connect a place of a village (river *ghat*, mini-market centre, school, health post, residential area, community forest, mill, factory, rural hydro power plant, a series of tube wells, etc.) with any one of the following:
 - ⇒ VDC Centre of the village
 - ⇒ another place within the VDC
 - ⇒ a place of the neighbouring VDC
 - ⇒ National Strategic Road Network
 - ⇒ District road.

Village Roads: smaller roads not falling under these categories are village roads. These roads are smaller, shortest roads, with smaller settlements; village roads are not included in detail analysis of DTMP

Urban Roads: All roads within the boundary of municipality are urban roads. Each municipality needs its separate transport infrastructure planning. Therefore urban roads are not included in detail analysis of DTMP

4.5 Synchronisation of Preliminary Road Network Plan with DTPP of Adjoining District.

Review of existing/ proposed road networks of adjoining districts are carried out. After ward, find all the missing links of proposed preliminary road network with adjoining districts. All the districts' Perspective Plans of each region are matched and suggestion exchanged in respect to inter-district transport linkages.

Concerned districts are to incorporate changes in each Perspective Plan, if any, to contribute to prepare the 'Regional Perspective Plan of Rural Road Network. Synchronisation of road network with adjoining district is done in cluster of Ilaka workshop.

4.6 Presentation of Proposed Preliminary Road network at DTICC meeting

Prior to disseminating information in cluster of Illaka level workshop, DTICC meeting is conducted and the proposed preliminary road network plan for inaccessible area is presented and discussed to verify and preliminary approval of the proposed road networks. All suggestions and feedbacks are collected from DTICC meeting and incorporated in preliminary proposed road network plan.

4.7 Cluster of Illaka level workshop

Preliminary network plan is presented and discussed in cluster of Ilaka level workshop to collect their views and proposal for DTPP (on the basis of preliminary road network). Road network plan is finalised in the workshop.

DDC should arrange cluster of Illaka workshops of one day for synchronizing the demands of the roads and therefore to develop the road NETWORKS, the sector workshop are held based on the geographical condition and centrality for the VDCs. The participants in the workshop are the DDC members, VDC Chairperson, Vice Chairperson, VDC secretary, representative of major political party members, community key persons and representatives from women, Dalit, Janjati, OBC, local NGO, INGOs and local line agencies etc. The efforts will be constantly kept for more participation from different sectors.

During the workshop the DTMP study team clarify the objective of the DTMP and process of its preparation, the Participants are divided into groups of their representative ilaka and discuss on their vision of network within their ilakas in the form of district roads and village roads. The group will prepare the list of potential future roads to the illaka members presented and rational. Plenary discussion will be encouraged to verify their views on new demands as well as on the existing networks of the roads.

Thus the agendas of Ilaka cluster workshop are:

- Presentation of IDPM
- Presentation of DIM
- Presentation of preliminary road network plan
- Synchronisation of roads in its border with the road points of adjoining districts.
- Identification of historical main trails (and places of prehistoric significance)

4.8 Socio-economic and Technical Survey

Collect socio-economic data of all proposed transport linkages by using PRA /RRA methods. The engineer and socio-economist with the help of research associate carry out a socio-economic and engineering pre feasibility study of the proposed transport linkages.

The data collection forms are related to

- Large settlement areas and their population within the influence area (2 hours of walking Distance on either side of proposed linkage in Terai and 4 hours in hills.
- Agricultural Land within the influence area
- Existing Markets, Historical place, religious place, tourist attraction Areas, local resources as NTFP/ MAPs and hydro power
- Engineering reconnaissance/pre-feasibility study.

CHAPTER FIVE: PREPARATION OF DISTRICT TRANSPORT PERSPECTIVE PLAN (DTPP)

After finalising the network plan, each new linkage is examined on the following basis:

5.1 Data entry and analysis

Data entry and analysis (in excel and using GIS applications wherever possible) of socio-economic data of influence area of proposed transport linkages collected from field.

Socio-economic data of influence area of proposed transport linkages collected from field are entered in excel and analysis is carried out. This analysis covers different aspect of the study such as population, cultivated land, functional index of market centres, traffic volume, technical analysis of roads etc.

A network consists of several links. It is not possible to construct all roads at a time due to resource and time constraint. Therefore each link in a network should be prioritized. After developing a district level network, road engineer prepares the cost estimate of the road link and benefit of each link in the network. It is already mentioned in section five that only direct benefits should be considered for the developed areas. It is obvious that the Economic Net Present Value (ENPV), Economic Internal Rate of Return (EIRR) and Economic Cost Benefit Ratio (ECBR) should be used for appraising the district road project. Based on those indicators, the roads should be prioritized. A minimum rate of return should be fixed beforehand below which the road should not be financed. The road with the highest economic rate of return should get the first priority and so on. A minimum rate of return screens out the road projects.

5.2 Scoring system for Prioritization

5.2.1 Scoring system for Prioritization of Proposed New Roads

A network consists of several links. It is not possible to construct all roads at a time due to resource and time constraint. Therefore each link in a network should be prioritized. After developing a district level network, a road engineer prepares the cost estimate the road and benefit of each link in the network. Cost Efficiency Analysis (CEA) is used to prioritise new transport linkage. Criteria such as per capita cost per and special social consideration (of inclusiveness) receive weights (points) relative to their perceived importance. Each road link is then allocated the number of points corresponding to the fulfilment of the particular criteria. The aggregate number of points that each intervention receives is computed by simply adding the points allocated per indicator. The result of this process leads to a ranking of the investment options. The following criteria are used for prioritization of new transport linkages.

Table 3: Scoring System for Prioritization of New Linkages

S.N.	Parameter	Scoring Unit	Score
i	Population per unit Cost	Population/investment Cost in 100000	55
ii	Cultivated Land	Cultivated Land/km	15
iii	Population x Walking hour	Population x Walking hour /km	20
iv	Total Population of poor, <i>Dalits</i> and marginalized <i>Janjatis</i> .	Population /km	10

5.2.2 Calculation of scores for Prioritization of New, Rehabilitation and upgrading of roads

In order to make the indicators comparable their results have to be transformed to dimensionless indices using the zero-to-one method.

The following formula is applied to each indicator of the area of investigation

(For high value ranking) $d = \frac{x - \text{min}}{\text{Max} - \text{min}}$ multiply by score

Where,

d= transformed indicator

x= original indicator value

Max = maximum original value

Min = minimum original value

For each area of investigation, the road link with the highest indicator value 'd' results in '1' multiplied by the highest mark available under the relevant indicators.

(Note: to avoid possible confusion, the value of lowest score, zero is transformed by relating it to the value of second lowest score using pro-rata distribution method)

Road Corridor	Road Length (km)	Population	Investment Cost (NRs)	Population /cost in lacks	Max Score	Calculation	Standard Score	Transform ed Score
A	B	C	D	E	F	G	H	I
				$=(C/D)*100000$				
Dunai-Triveni	39	6480	13360969	48	55	$(48-3)*55/(48-3)$	55.00	55.00
Dunai-Maure-	53	3950	18157214	22	55	$(22-3)*55/(48-3)$	23.22	23.22

Jumla								
Dunai-Dho	72	1160	39385670	3	55	$(3-3)*55/(48-3)$	0.00	0.88*
Dunai-Phoksundo	42	970	22974974	4	55	$(4-3)*55/(48-3)$	1.22	1.22
Dunai-Dhorpatan	45	750	24616044	3	55	$(3-3)*55/(48-3)$	0.00	0.88*

Figures from following Table (Population per unit cost) have been used to show example of the calculation.

- Transformed by relating the lowest value (3) to next lowest value i.e. $3/4 * 1.22=0.88$

(For low value ranking)

$d = \frac{\text{max}-x}{\text{max}-\text{min}}$ multiply by score

Max-min

Where,

d= transformed indicator

x= original indicator value

Max= maximum original value

Min= minimum original value

For each area of investigation, the road link with the lowest indicator value 'd' results in '1' multiplied by the maximum available score.

(Note: to avoid possible confusion, the value of lowest score, zero is transformed by relating it to the value of second lowest score using pro-rata distribution method)

Figures from following Table (cost per Traffic Unit) have been used to show example of the calculation.

S.N.	Road Corridor	Road Length (Km)	Rehabilitation Cost (NRs)	Traffic Unit	Cost per Traffic Unit	Max Score	Calculation	Standard Score	Transformed Score
1	Dunai-Triveni	39	1500000	200	7500	70	Standard Score	70	70.00
2	Dunai-Maure-Jumla	53	1200000	125	9600	70	$(30435-9600)*70/(30435-7500)$	64	63.59
3	Dunai-Dho	72	1000000	60	16667	70	$(30435-16667)*70/(30435-7500)$	42	42.02
4	Dunai-Phoksundo	42	1500000	55	27273	70	$(30435-27273)*70/(30435-7500)$	10	9.65
5	Dunai-Dhorpatan	45	1400000	46	30435	70	$(30435-30435)*70/(30435-7500)$	0	8.65*

- Transformed by relating the lowest value (3) to next lowest value i.e. $27273/30435 * 10=8.65$

5.2.3 Indicator for Prioritization for New Linkage

Four parameters are proposed to use for the prioritization of the new transport linkages. The indicators are broadly based on socio-economic and technical data related to each individual road corridor; they are

1. Population per unit Cost

Population per unit cost has been taken as an important parameter for prioritization of linkage. Considering its importance, it has been given high score (55). To prioritize the linkage from this parameter, population of influence area and cost of linkage are required. The population within the zone of influence (ZOI) area i.e. left and right of the road link within 2 hours walking time in terai and 4 hours walking time in hills is taken as the beneficiaries of a proposed road. Estimating population within ZOI needs careful division. After locating the ZOI, the settlements within that ZOI should be identified. Collection of settlement level population is very difficult, so if settlement wise population is not available, ward-wise population can be collected from VDC office or other VDC level service centres and summed up all ward-wise population to get the total number of population.

Population per unit cost is calculated from total population divided by investment cost in lakh (hundred thousand) rupees i.e. no of person per 100000 rupees. The road having the highest beneficiaries population per investment cost is given highest score i.e. 55.

In term of investment cost of road, costs include the construction, environmental mitigation and maintenance of the road projects.

Project cost of road is to be calculated for four types of road:

- New construction
- Rehabilitation/completion of roads under construction
- Maintenance cost and
- Upgrading of fair weather road to all weather (pavement works - gravel, otta/gravel seal etc.)

These costs vary for terai and the hills as follows.

Hill area:

New road construction cost in hill is primarily influenced by the alignment terrain type. Three types of terrain are to be considered for cost calculation of cost. Cost of valley roads is highest in hill roads. Valley roads need many drainage works –both side drains and cross drains. It encounters plenty of rocky sections, especially in lower valley parts. Experience shows that district roads cost about NRs 8 million per kilometre in average, which includes excavation works, retaining structures and drainage structures, but without pavement works. Normally ridge roads are the least cost hill roads. Less drainage works are required and less rocky section encountered. Therefore ridge roads cost is less compare to other type of terrain. It is about half of the cost of valley roads e.g. NRs 4 million rupees per kilometre, even less in some cases. Cost of roads ascending from valley and roads descending from ridge roads i.e. NRs 6 million per kilometre in average.

Thus while calculating the cost of roads, these three bases shall be considered. But one road may consist of two types or all three types of terrain. In such case, length of the road is divided into these three categories and calculated accordingly. Cost given above is indicative only. Each district shall calculate the cost separately.

Terai Area:

For Terai no such variation exists, cost varies mainly with the width of the road. More realistic cost shall be calculated separately for each road for different districts after studying the various cost scenarios of each district. Cost for environmental mitigation (slope stabilisation) is also to be calculated and add to determine the total cost.

Example for Scores of proposed roads based on Population per unit Cost

Road Corridor	Road Length (km)	Population	Investment Cost (NRs)	Population /cost in lacks	Standard Score (55)	Transformed Score
A	B	C	D	E	G	H
				$=(C/D)*100000$		
Dunai-Triveni	39	6480	13360969	48	55.00	55.00
Dunai-Maure-Jumla	53	3950	18157214	22	23.22	23.22
Dunai-Dho	72	1160	39385670	3	0.00	0.88*
Dunai-Phoksundo	42	970	22974974	4	1.22	1.22
Dunai-Dhorpatan	45	750	24616044	3	0.00	0.88*

2. Cultivated land

It is very important that a road should be economically viable; however, the economic benefit is a broader phenomenon that includes several economic activities which are difficult to quantify. Therefore, cultivated land is taken as a one of the parameter for prioritisation of proposed transport linkage. The cultivated land within the zone of influence (ZOI) area i.e. left and right of the road link within 2 hours walking time in terai and 4 hours walking time in hills is taken

Example for Scores of proposed roads based on Cultivated Land

S.N	Road Corridor	Road Length km	Cultivated land in ha	Cultivated land in ha/km	Score(15)	Transformed Score
1	Dunai-Triveni	39	1520	39	15.00	15.00
2	Dunai-Maure-Jumla	53	950	18	5.89	5.89
3	Dunai-Dho	72	750	10	2.63	2.63
4	Dunai-Phoksundo	42	330	8	1.53	1.53
5	Dunai-Dhorpatan	45	195	4	0.00	0.84

3. Population × Walking Hour

The population within the zone of influence (ZOI) area i.e. left and right of the proposed road within 2 hours walking time in terai and 4 hours walking time in hills is collected. Estimating population within Zol needs careful division. After locating the Zol, the household within that Zol should be

measured within the range of ZOI from GIS maps. Total population within the range (20 minute, 2 hours and 6 hours) of zone of influence area is then multiplied by average walking distance and then divided by total km of proposed road.

The Linkage having the highest per km number of populations get the highest score i.e. 20.

Example for Scores of proposed roads based on Population.*Walking Hour

S.N	Road Corridor	Road Length km	Population*waking Hour	Pop.*Walking Hour/km	Score(20)	Transformed Score '(20)
1	Dunai-Triveni	39	22680	582	20.00	20.00
2	Dunai-Maure-Jumla	53	9875	186	4.89	4.89
3	Dunai-Dho	72	4350	60	0.08	0.08
4	Dunai-Phoksundo	42	3880	92	1.30	1.30
5	Dunai-Dhorpatan	45	2625	58	0.00	0.077

4. Total Population of poor, Dalits and marginalized Janjatis.

The areas inhabited by poor, *dalits*, *janajati* and marginalized people are consider as parameter for prioritization of roads. In this regards, the population of **poor, dalits and marginalized janjatis** within the zone of influence (ZOI) area are collected from ward level or VDC level records or from key informant.

Example for Scores of proposed roads based on total population of poor, Dalits and marginalised Janjatis.

Road Corridor	Total Population	Road Length km	Population of Dalit, poor, Janazati within ZOI	Population Population of Dalit, poor, Janazati within ZOI ./km	Score(10)	Transformed Score
Dunai-Triveni	6480	39	2592	66	10.00	10.00
Dunai-Maure-Jumla	3950	53	2370	45	6.38	6.38
Dunai-Dho	1160	72	464	6	0.00	0.24
Dunai-Phoksundo	970	42	485	12	0.85	0.85
Dunai-Dhorpatan	750	45	375	8	0.31	0.31

5.2.4 Scoring system for prioritisation of Rural Roads Class A and Class B for rehabilitation

The following criteria are proposed for prioritisation of District and Village Roads for rehabilitation

Table 4: Scoring System for Prioritisation for Rehabilitation

S. No.	Criteria	Scoring Unit	Score
1	Traffic Unit	cost /TU	70
2	Cost	Cost /km	20
3	Market /service centre	Centrality Index	10
Total			100

1. Traffic Unit

Information of Traffic data are collected from field data. Cost estimate is based on the data collected during the walkover survey for inventory of existing road. Unit costs are calculated on the basis of district approved rate for labour and materials. Various types of vehicular and pedestrian traffic occupy the surface of rural transport linkage and impose different loads on the structure. Therefore, it is necessary to quantify the various traffic volumes in terms of a standard traffic unit, called 'Transport Unit (TU)' or the 'Passenger Car Unit (PCU)' which is defined as the traffic caused by a normal car, light van, jeep or a pick-up traveling at a speed of 40 km/h. The composition of traffic and the respective traffic coefficients are given below. These coefficients shall be followed during the designing process.

Type of Traffic	Transport Unit (TU)
Cars, light vans, jeeps and pick-ups	1.0
Light trucks up to 2.5 tonnes gross	1.5
Trucks up to 10 tonnes gross	3.0
Trucks up to 15 tonnes gross	4.0
4W Tractor towed trailers - standard	3.0
2W Tractor towed trailers - standard	1.5
Buses up to 40 passengers	3.0
Buses over 40 passengers	4.0
Bicycles	0.5
Rickshaws and tricycles carrying goods	1.0
Carts pulled/pushed by the human beings	2.0
Bullock carts with pneumatic tyre wheels	6.0
Bullock carts with wooden wheels	8.0
Mule carts or horse drawn carts	6.0
Pack animals and mules	2.0
Pedestrians walking on the link	0.2
Porters walking on the link	0.4

Example of scores of proposed roads based on Traffic Unit

S.N.	Road	Road Length (Km)	Traffic Unit	Calculation		Score (70)	Transformed Score (70)
				Max	Min		
1	Dunai-Triveni	39	200	200	46	70.00	70.00
2	Dunai-Maure-Jumla	53	125	200	46	35.91	35.91
3	Dunai-Dho	72	60	200	46	6.36	6.36
4	Dunai-Phoksundo	42	55	200	46	4.09	4.09
5	Dunai-Dhorpatan	45	46	200	46	0.00	3.42

2. Cost for Rehabilitation

Cost estimate is based on the data collected during the walkover survey for inventory of existing road. Unit costs are calculated on the basis of district approved rate for labour and materials. The Linkage having the lowest per km cost get the highest score i.e. 20. (For low value ranking)

Example of scores of proposed roads based on Cost

S.N.	Road	Road Length (Km)	Rehabilitation Cost	Cost /km	Score (20)	Transformed Score (20)
1	Dunai-Triveni	39	1500000	38462	0.000	7.27
2	Dunai-Maure-Jumla	53	1200000	22642	45.066	63.59
3	Dunai-Dho	72	1000000	13889	70.000	42.02
4	Dunai-Phoksundo	42	1500000	35714	7.826	9.651
5	Dunai-Dhorpatan	45	1400000	31111	20.939	8.648

3. Market /service centre

Market Survey is carried out to identify market and service centre. Data and information collected in the field is the main basis for determining the importance on relative importance of market/service centre and central places. Only those functions should be selected that attract trips from the hinterland settlements. Normally for evaluation purpose data of offices, industry, business & commerce, education, and health, are combined for the centre and its influence area. Assessment of economic facilities and services existing in the market/service centres and their catchments areas leads to the identification of the most important market/service centre. All proposed roads score are based on centrality index of market /service centre by using same calculation method (For high value ranking)

Example for Scores of proposed roads based on Market/ Service centres

S.N	Road Corridor	Market/Service Centre	Centrality Index	Total centrality Index	Standard Score (10)	Transformed Score (10)
1	Rupgad-Majhpal	rupgad	43	43	0.00	0.34
2	Juphal Majhpal	Juphal	63	63	1.29	1.29
3	Juphal-Shun	Juphal	63	63	1.29	1.29
4	Marium-Tinge-Dho	Dho	49	198	10.00	10.00

S.N	Road Corridor	Market/Service Centre	Centrality Index	Total centrality Index	Standard Score (10)	Transformed Score (10)
		Tinge	49			
		imp.market	100			
5	Tinge-Saldang-Vijer	Tinge	49	49	0.39	0.39
6	Chharka-Lomanthang	imp.market	100	100	3.68	3.68
7	Phoksundo-Saldang	Phoksundo	49	49	0.39	0.39

5.2.5 Scoring system for Prioritisation of Rural Roads Class A and Class B for Up-grading

The following criteria are proposed for prioritisation of District and Village Roads for up-grading.

Table 4: Scoring System for Prioritisation for Upgrading

S. N.	Criteria	Scoring Unit	Score
1	Future Traffic Unit	TU	70
2	Cost	Cost /km	20
3	Market /service centre	Centrality Index	10
Total			100

1. Future Traffic Unit

There are different ways of estimating the existing traffic. The volume of traffic does not remain constant throughout the road. It changes as one proceeds ahead because the traffic is distributed among different tertiary roads. Therefore, the volume of traffic should be counted in each of the junctions from where the volume of traffic is either increased or decreased. It is relatively difficult to estimate the generated traffic because it depends upon several factors. However, one has to estimate based on the several criteria. It is easier if there is a precedence of similar places. The issue of diverted traffic is rather easier to calculate. For instance, how many people using airplane at present will shift to the motor vehicle once the road is constructed. Socio-political need identification is appropriate for estimating the future transport demand. The future population, agricultural activities and future economic activities in the ZOI of a road are the determining factors of the future transport demand. As mentioned above, it is easier to estimate the future population but estimating the future agricultural activities and future economic activities are the difficult tasks.

Example scores of proposed roads based on Traffic Unit

S.N.	Road	Road Length (Km)	Traffic Unit	Calculation		Score (70)	Transformed Score (70)
				Max	Min		
1	Dunai-Triveni	39	200	200	46	70.00	70.00
2	Dunai-Maure-Jumla	53	125	200	46	35.91	35.91
3	Dunai-Dho	72	60	200	46	6.36	6.36
4	Dunai-Phoksundo	42	55	200	46	4.09	4.09
5	Dunai-Dhorpatan	45	46	200	46	0.00	3.42

2. Cost estimate for Upgrading of Roads

Cost estimate is based on the data collected during the walkover survey for inventory of existing road. Unit costs are calculated on the basis of district approved rate for labour and materials. The linkage having the lowest per km cost get the highest score i.e. 20. (For low value ranking)

Example of scores of proposed roads based on Cost

S.N.	Road	Road Length (Km)	Upgrading Cost	Cost /km	Score (20)	Transformed Score (20)
1	Dunai-Triveni	39	1500000	38462	0.000	7.27
2	Dunai-Maure-Jumla	53	1200000	22642	45.066	63.59
3	Dunai-Dho	72	1000000	13889	70.000	42.02
4	Dunai-Phoksundo	42	1500000	35714	7.826	9.651
5	Dunai-Dhorpatan	45	1400000	31111	20.939	8.648

3. Market /service centre

Market Survey is carried out to identify market and service centre. Data and information collected in the field is the main basis for determining the importance on relative importance of market/service centre and central places. For evaluation purpose, data of offices, industry, business & commerce, education, and health, are combined for the centre and its influence area. Assessment of economic facilities and services existing in the market/service centres and their catchments areas leads to the identification of the most important market/service centre. All proposed roads scores based on centrality index of market /service centre by using same calculation method (For high value ranking)

Example for Scores of proposed roads based on Market/Service Centres

S.N	Road Corridor	Market/Service Centre	Centrality Index	Total Centrality Index	Standard Score(10)	Transformed Score
1	Rupgad-Majhpal	rupgad	43	43	0.00	0.34
2	Juphal Majhpal	Juphal	63	63	1.29	1.29
3	Juphal-Shun	Juphal	63	63	1.29	1.29
4	Marium-Tinge-Dho	Dho	49	198	10.00	10.00

S.N	Road Corridor	Market/Service Centre	Centrality Index	Total Centrality Index	Standard Score(10)	Transformed Score
		Tinge	49			
		imp.market	100			
5	Tinge-Saldang-Vijer	Tinge	49	49	0.39	0.39
6	Chharka-Lomanthang	imp.market	100	100	3.68	3.68
7	Phoksundo-Saldang	Phoksundo	49	49	0.39	0.39

1. Cost of Trail Bridge:

For the construction, rehabilitation and maintenance of trail bridges, norms and practice of Trail Bridge Support Unit shall be adopted.

5.2.6 Prioritisation of Proposed Trail Bridge

The prioritization will be based on following formula derived on the basis of a simulation model using ICIMOD indices, related poverty, education, health etc. used by TBSU as follows:

Prioritization Formula for New Construction

SSTB	$\{(2.041 P+2.856 MP)\times DG\} \times \{((12-RT)\times(1+RF/100))/12\}$
LSTB	$0.3 \times \{(2.041 P+2.856 MP)\times DG\} \times \{((12-RT)\times(1+RF/100))/12\}$

Prioritization Formula for Major Maintenance

SSTB	$2 \times \{(2.041 P+2.856 MP)\times DG\} \times \{((12-RT)\times(1+RF/100))/12\}$
LSTB	$1.2 \times \{(2.041 P+2.856 MP)\times DG\} \times \{((12-RT)\times(1+RF/100))/12\}$

Prioritization Formula for Rehabilitation

SSTB	$1 \times \{(2.041 P+2.856 MP)\times DG\} \times \{((12-RT)\times(1+RF/100))/12\}$
LSTB	$0.3 \times \{(2.041 P+2.856 MP)\times DG\} \times \{((12-RT)\times(1+RF/100))/12\}$

Where,

P = Population i.e. the beneficiaries population of the prospective bridge

MP= Marginalized population (total dalit + marginalized janajatis + total minority + total poor from other caste)

DG= Distance Gained

R= River Type (no. of months crossable without a bridge)

RF= Risk Factor (Percent of population that has died within the last five year.

On the basis of prioritization criteria, the transport linkages under the categories of new construction for each class of roads are prioritized.

5.3: After overlay all New Linkages in the DIM, DTPP is prepared.

5.4: Presentation of Draft District Transport Perspective Plan (DTPP) in DTICC and finalisation of DTPP.

Draft District Transport Perspective Plan should be presented in one day DTICC meeting. Study team explains the process of prioritization of proposed transport linkages. All participants of DTICC are encouraged to be involved in active participation in discussion. In the meeting, in-depth discussion are done to verify the proposed transport linkages and their comment and feedbacks are collected and based on received comments, final DTPP is prepared

Chapter Six: Preparation of Five Year District Transport Master Plan

6.1: List all transport linkages given in the Perspective Plan

List all transport linkages given in the Perspective Plan, under the following categories:

- new construction
- rehabilitation
- Periodic maintenance
- Upgrading

These lists should be prepared separately for various classes (District Road, Village Road, Main Trail and Trail Bridges)

6.2: Five Year's Projected Financial Plan

- Prepare next Five Year's Projected Financial Plan by accounting all possible financial resources of DDC and concerned VDCs.
- Provide projected amounts for each year to the District Development Committee and request DDC to approve the respective percentages which should be applicable for each category (new, rehabilitation, upgrading and periodic maintenance) under each class of the roads.
- Allocate maintenance budget for all the existing maintainable roads and trail bridges.
- Based on the approved percentages, determine the tentative lengths that could be undertaken in each year, in each category and under each class (new construction and rehabilitation).
- Allocate budget for upgrading of existing roads from fair weather to all weather (earth surface to gravel surface and addition of river crossing based on the traffic and trade volume).

6.3: Five Year District Transport Master Plan

- Prepare Five Year District Transport Master Plan with year-wise priority lists which should be implemented in the first, second, third, fourth and fifth year.
- Discuss and finalise the Five Year District Transport Master Plan with year-wise priority lists in DTICC.
- DTICC shall submit it to the District Development Committee for approval.

6.4 Endorsement of the Five year District Transport Master Plan of District RTI Network

DDC should submit the final District Transport Master Plan to District Council for approval. DTICC with the support of planning team brief the Council on the entire process of preparation including scoring system for prioritization. The DTMP is finally approved by the District Council.

Annexes

**Annex I: Guideline, Formats, Questionnaire
and Criteria**

Annex I-1
GUIDELINES 'A'

GUIDELINES 'A'

**For Preparation of Indicative Development Potential Map (IDPM) of District
(Analysis of District Profile - Grading of Markets)**

A. Objective :

The objective of Indicative Development Potential Map is to show different areas and sites in the district that offer significant potential for development.

B. Steps :

Step I. Prepare a GIS based District Base Map in 1:25,000 scale or in 1:50,000 scale (preferably in 1:25,000 scale if topographical map of the same scale is available). The Base Map should show:

- VDCs/Municipalities with their boundaries;
- Large settlements;
- National strategic roads, existing district roads and trails;
- important water bodies (rivers, lakes, etc.); and
- important historic and religious places.

Step II. Obtain information regarding location and significance of development potential areas in the district.

a) Rural development potential areas, typically include:

- areas with extensive agriculture;
- areas with extensive horticulture;
- areas with high potential for livestock farming;
- areas with high potential for fisheries;
- areas with potential for high valued cash crops;
- areas suitable for cottage and agro-based industries;
- potential centres for business/commerce/markets;
- potential areas for tourism;
- potential sites for development of hydropower and water mills;
- potential sites for mining;
- potential service centres e.g. hospital, school, campuses;
- important forest areas; and
- Others

(specify)

.....

b) Obtain the information from the existing available sources, for example;

- maps (topographical maps, district administrative maps, trail map, forest map, geological map, etc.),
- relevant literature/study reports, and

-
- Conduct an extensive consultation with various persons like employees of different line agencies, NGOs, elected representatives, businessmen, etc. who are likely to have knowledge about such areas. The information obtained through the process of consultation should be cross-checked and whenever doubt exists, planner should send someone to the concerned area for quick verification.

Step III: Traffic Survey

Traffic counts are conducted to record the level of use of a road, as well as to classify the vehicles by type. The main output from a traffic count is a measure of average traffic flow, recorded as the total traffic passing in both directions over a 24 hour period (the Average Daily Traffic or ADT). Traffic counts on low volume rural roads should also include pedestrians, bicycles and other non-motorised means of transport (NMTs). Local knowledge should also be used to pick appropriate locations for conducting the traffic counts to ensure a true reflection of the traffic using the road to avoid under or over counting. Factors to look for include:

- Avoid counting too close to towns and villages
- Be aware of the location of junctions and the impact of these on traffic flows
- Pedestrians and NMT's may use local footpaths and tracks in addition to the road.

When counting this type of traffic ensure that the count station is located to capture all traffic

- Rural people predominantly travel as the sun is rising and as the sun is setting
- When counting in the wet season have knowledge of local diversions on poor roads

Considering limitation of timeframe, moving Observer Count (MOC) method has been proposed to conduct traffic survey. The survey can be executed at any location of a particular road section but should last at least one hour. A traffic survey form is used for MOC surveys. Utilizing the traffic survey form, the different types of vehicles need to be put into three different categories: (a) vehicles travelling in the opposite direction (x); (b) vehicles overtaking observer (y); and (c) vehicles overtaken by the observer (z). Following will then be the hourly traffic in both directions (HT):

$$HT = (x + y - z) / t$$

To convert the hourly flow into daily flows the

Following formula normally applies:

$$DT = 16 \times HT$$

Where,

HT = hourly traffic

x = vehicles travelling in opposite direction

y = vehicles overtaking the observer

z = vehicles overtaken by the observer

t = time in hours

DT = Daily traffic

Step IV: Market Survey

Market Survey is carried out to identify market and service centre. Data and information collected in the field is the main basis for determining the relative importance of market/service centre and central places. All services existing in a particular centre are listed by the district line agencies and supplemented by more detailed field data such as economic population structure collected for the centre itself and its influence area, by means of P-RRA approach. For evaluation purpose data from line offices, Industry, Business & Commerce, Education, Health, Communication, Electricity Supply, Drinking Water Supply services are combined for the centre and its influence area. Assessment of economic facilities and services existing in the market/service centres and their catchments areas leads to the identification of the most important market/service centre. Centrality analysis of the market facilities and government services are carried out.

The Centrality Index is calculated using following formula

$$C_j = \sum_{i=1}^n (W_i X_{ij})$$

Where,

C_j = Centrality Index of the jth market centre

X_{ij} = value of the ith function (number of establishments or shops at the jth market centre)

W_i = Weightage of the jth function

The weight of each function was calculated by adopting the Median Threshold Population Technique. The Median Threshold Population Technique calculates the weight as:

$$W_i = \frac{\text{Median population of the } i\text{th function}}{\text{Lowest median population of the market centres where a function exists}}$$

Weightage are assigned to different type of economic facilities and governments services and they are then aggregated. Based on the centrality index, the market centre should be categorized as first grade, second grade, and third grade market/Service centres. Graded market centres are plotted in GIS map.

Market is graded and this shall be the basis for network planning in the inaccessible area, rehabilitation and upgrading of existing roads.

The whole Transport Network Planning depends on hierarchy of Market/service centres, so the market survey should be conducted more cautiously

S.N.	Name of Market centre	Population	EDUCATION			HEALTH		BUSINESS & COMMERCE						INDUSTRY				OFFICES						Centrality Index	Ranking	Grading of Market Centre											
			Campus (no)	High School (no.)	Primary School (no.)	Hospital (no.)	Health Post (no.)	Hotels & Lodges (no.)	Restaurants & Tea Stalls (no.)	Grocery Shops (no.)	Hardware Shop (no)	Medical Shop (no)	Clothes/readymade shop (no)	Household goods	Stationery	Rice & flour Mills (no.)	Water mill (no)	Forest Based Industry (no)	Handicraft (no)	Mechanical/Fabrication (no)	Agro-based (no)	Bank (no.)	Agriculture Service centre no				Veterinary office (no)	Post office (no)	Telephone office (no)	Electricity office (no)	Cooperatives office (no)	NGO (no)					
Total Functions																																					
Median Population																																					
Weight																																					

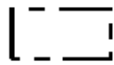










Step V: Finalize the Indicative Development Potential Map.
















The collected information is plotted on the base map indicating their geographical boundaries as accurately as possible. Base Map on which all the development potential areas and sites are plotted is the draft Indicative Development Potential Map (IDPM) of the district.


Brief notes on each plotted area of development potential are prepared. The description should highlight the nature and size of the area. The draft IDPM and the corresponding brief notes are presented to the DTICC. This could be done in a one-day workshop organized at the district headquarters. Based on the feedback (review, comments, etc.) from the concerned parties, refine the map and corresponding brief notes.

C. Legend :

The symbols given in the next page are recommended for use in the preparation of Indicative Development Potential Map.

<u>Legend</u>	<u>Symbol</u>
* Boundary of a VDC/Municipality	
* District Headquarters	
* VDC Centre	
* National strategic road	
* Existing district road	
* Existing main trail	
* Major rivers	
* Area (existing/potential) with extensive agriculture	
* Area (existing/potential) with extensive horticulture	
* Area (existing/potential) with livestock farming	
* Area (existing/potential) with NTFP & MAPs	

<u>Legend</u>	<u>Symbol</u>
* Area (existing/potential) with high valued cash crops	
* Centre (existing/potential) for agro-based and cottage industries	
* Potential site for hydropower development	
* Potential site for mining	
* Religious/Historical/Tourism site	
* Service centre Cemetery Hospital Police post Post office School (campus) Health post	     
* Market center grading	 A  B  C  Potential

<u>Legend</u>	<u>Symbol</u>
<p>* Land cover</p> <p>Cultivation</p> <p>Cutting/cliff</p> <p>Other (barren land)</p> <p>Other (sand)</p> <p>Pond/lake</p> <p>River/stream</p> <p>Vegetation (bush)</p> <p>Vegetation (forest)</p> <p>Vegetation (grass)</p> <p>Vegetation (orchard)</p>	 <p>The legend symbols are a vertical column of 12 colored squares. From top to bottom, the colors are: light yellow, light orange, orange, dark orange, light blue, medium blue, light green, dark green, bright green, and dark brown.</p>

Annex I-2

NEPAL RURAL ROAD STANDARDS

NEPAL RURAL ROAD STANDARDS

The Classification of Rural Transport Linkages

In line with Government of Nepal's decentralisation policy, the overall responsibility for planning, construction (new, rehabilitation and upgrading) and maintenance (periodic and routine) of the rural transport linkages lies with the concerned District Development Committees (DDCs) under the policy advice and guidance of the Ministry of Local Development (MLD). The Department of Local Infrastructure Development and Agricultural Roads (DoLIDAR) under MLD through its decentralised institutions, viz. District Technical Office (DTO) holds the technical responsibility for the development of rural transport network in the country. This document, 'Nepal Rural Road Standards' provides the classification and other general standards for **Rural Transport Network** and shall be followed by all concerned (users, users' committees, VDCs, DDCs, DTOs and DoLIDAR) in developing the rural transport linkages in Nepal.

The standards for **Strategic Road Network** (National Highways, Feeder Roads) and Urban Roads which are under the jurisdiction of Department of Roads (DOR) are excluded in this document but are available in the 'Nepal Road Standard (2027) - Second Revision'.

1.0 General

- 1.1 Nepal Rural Road Standard (NRRS) shall apply to all rural transport linkages (roads, trails and rope ways) being constructed within Nepal. The roads other than that of National Strategic Road Network (National Highways, Feeder Roads) and Urban Roads are considered as rural transport linkages, along with the trails and rope ways.
- 1.2 Under very special circumstances (e.g. an alignment along a highly unstable, landslide-prone area in hills or a path over a flood dam in Terai), Government of Nepal may waive these standards.
- 1.3 The initial traffic volumes (counted or projected) on most of the rural transport linkages are generally low but are expected to rise considerably over the first 5-10 years as a result of newly opened up access to development functions. Therefore, the linkages that are initially opened up should have the in-built provision for further improvements to meet the rising demand of traffic volumes.
- 1.4 These considerations conclude that the rural transport linkages should be designed for stage construction, beginning with the lowest standard and gradually upgrading to the highest possible standard. Upgrading, or in other words, gradual modification to the existing standard shall be done as and when the defined criteria for such action is completely satisfied.
- 1.5 At any development stage of the rural transport linkage, it must operate with the desired traffic volume at the lowest cost per kilometre. The overall annual cost shall comprise of:

- i. the amortised cost of the original investment for the linkage and/or that required to upgrade it to the stage under consideration (per vehicle-kilometre);
- ii. the annual cost of maintaining the linkage (per vehicle-kilometre);
- iii. ^α the annual cost required to operate the linkage (per vehicle-kilometre).

2.0 Classification of Rural Transport Linkages in Nepal

2.1 All rural transport linkages in Nepal are classified into five classes. These classes could generally be separated into three categories, as given below.

- two classes in Road category
- two classes in Trail category, and
- one class in Rope way category

2.2 The criteria for the classification of rural transport linkages are as follows:

1. **by the function of linkage**

Based on the strategic functions (national integration, public security, access to highly potential development areas - agriculture, tourism, rural hydro power, irrigation, cottage and micro industry, mining, etc.) or as per the public demand on the localised services (marketing, health, education, rural electrification), the class of rural transport linkage shall be decided.

by the level of users

When the link is newly opened up for a particular area, the users begin to grow in number as well as the means of usage differs with the increase in opportunities. As a result, the composition of users becomes more and more complex and the need for an upgrading of linkage will arise. The class of rural transport linkage shall be upgraded when the CRITERIA 'A' is fully satisfied.

3. **by the traffic volume**

The traffic volume is the ultimate result of having a transport linkage. It has a direct relationship with the geometric (dimensions) and technical standard (earthen, graveled, and paved) of the linkage. When the traffic volume increases above the design capacity, the linkage shall be considered for upgrading based on the CRITERIA 'A'.

4. **by the topography**

The topography of the terrain influences the selection of a particular class of linkage. For example, a linkage through an environmentally sensitive area in hills may be taken up as a trail and a linkage through a highly difficult mountainous region may be a rope way.

^α With the increment of traffic volume, the need for upgrading the linkage is to increase the safety and lower the (ii) and (iii). If standards are not raised as per the usage, then (i) shall decrease but there shall be a heavy resultant increase in (ii) and (iii).

2.3 The five classes of the rural transport linkages are defined respectively as follows:

A. District Road Class 'A' (RRA) - DISTRICT ROAD-A

- Market Grade A to Market Grade A
- Market Grade A to Market Grade B
- Connecting more than three VDC/service centres
- Linking Market Grade A with high way , feeder road or RRA
- All rural roads which connect one or more major Growth Centres (market, tourism centre, industry, etc.) or several VDCs with the headquarters of the same/neighbouring district,
 - ⇒ directly or
 - ⇒ Through the National Strategic Road Network.

B. District Road Class 'B' (RRB) - District Road-B

- Market Grade A to Market Grade C
- Market Grade B to Market Grade C
- Connecting more than one VDC/service centres
- Linking Market Grade B or C with any other linkage
- All rural roads which connect a Village Development Committee Centre (VDC) with any one of the following:
 - ⇒ another VDC Centre
 - ⇒ National Strategic Road Network
 - ⇒ district road
 - ⇒ A major Growth Centre of the same/neighbouring district.
- All rural roads which connect a place of a village (river *ghat*, mini-market centre, school, health post, residential area, community forest, mill, factory, rural hydro power plant, a series of tube wells, etc.) with any one of the following:
 - ⇒ VDC Centre of the village
 - ⇒ another place within the VDC
 - ⇒ a place of the neighbouring VDC
 - ⇒ National Strategic Road Network
 - ⇒ District road.

Village Roads: smaller roads not falling under these categories are village roads. These roads are smaller, shortest roads, with smaller settlements; village roads are not included in detail analysis of DTMP

Urban Roads: All roads within the boundary of municipality are urban roads. Each municipality needs its separate transport infrastructure planning. Therefore urban roads are not included in detail analysis of DTMP

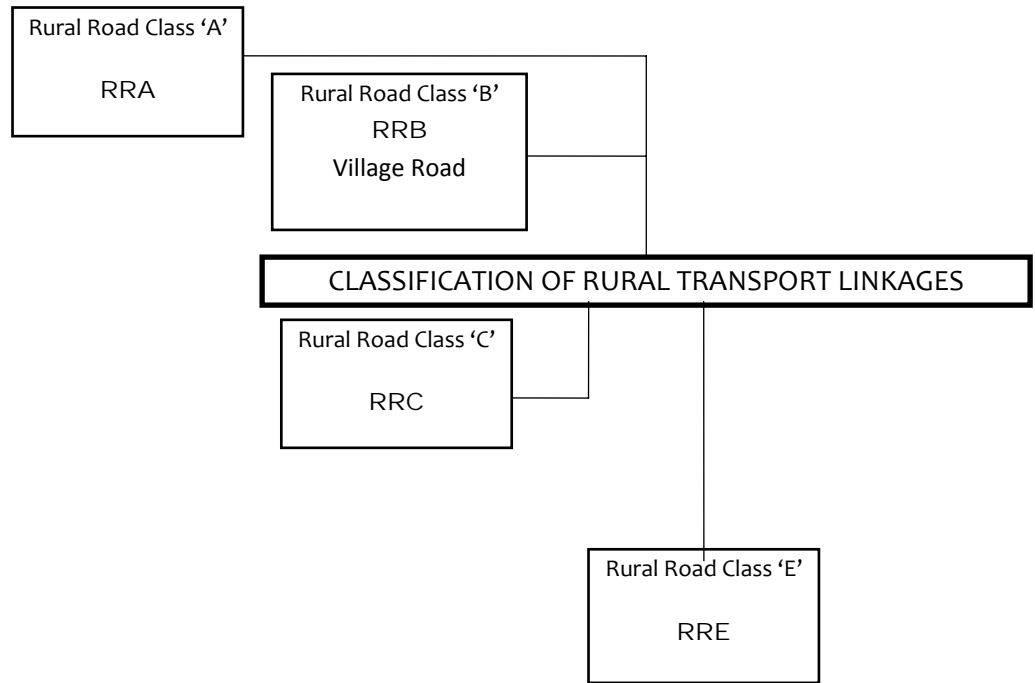
C. Rural Road Class 'C' (RRC) - MAIN TRAIL

- All major non-motorable foot/mule trails which connect a VDC Centre with any one of the following:
 - ⇒ the district headquarters of the same/neighboring district
 - ⇒ National Strategic Road Network

- ⇒ district road
- ⇒ village road
- ⇒ another VDC Centre
- ⇒ a major Growth Centre of the same/neighboring VDC.

E. Rural Road Class ‘E’ (RRE) - ROPE WAY

- In the high mountainous region where construction of trails (with sufficient width) is impossible, rope ways shall be considered. One of the main purposes of such rope ways would be the transportation of goods (consumer items, fuel, fertiliser, agricultural and livestock products) to and from the pocket areas where high value crops are being produced. However, the amortised cost of construction and the annual cost of operation and maintenance of rope way shall be justified by the increased socio-economic benefits of the area^β.



3.0 Traffic

3.1 It is not financially viable to improve the standard of a rural transport linkage by a small margin since the heavy cost involved does not justify the marginal benefits. Therefore, it is the accepted practice to design and construct new transport linkages or upgrade the existing ones that are suitable of undertaking a higher traffic volume which is anticipated at some future date. For rural transport linkages in Nepal, this projected period shall be considered as 10 years.

3.2 Various types of vehicular and pedestrian traffic occupy the surface of rural transport linkage and impose different loads on the structure. Therefore, it is necessary to quantify the various traffic volumes in terms of a standard traffic unit, called `Transport Unit (TU)' or the

^β This version of Nepal Rural Road Standard does not cover the technical standards required for the **Rural Road Class ‘E’** but hereby makes the provision for future revision when the need arises.

'Passenger Car Unit (PCU)' which is defined as the traffic caused by a normal car, light van, jeep or a pick-up travelling at a speed of 40 km/h.

- 3.3 The composition of traffic and the respective traffic coefficients are given below. These coefficients shall be followed during the designing process. (Applicable only for Rural Road Class 'A' and 'B').

Type of Traffic	Transport Unit (TU)
Cars, light vans, jeeps and pick-ups	1.0
Light trucks up to 2.5 tonnes gross	1.5
Trucks up to 10 tonnes gross	3.0
Trucks up to 15 tonnes gross	4.0
4W Tractor towed trailers - standard	3.0
2W Tractor towed trailers - standard	1.5
Buses up to 40 passengers	3.0
Buses over 40 passengers	4.0
Bicycles	0.5
Rickshaws and tricycles carrying goods	1.0
Carts pulled/pushed by the human beings	2.0
Bullock carts with pneumatic tyre wheels	6.0
Bullock carts with wooden wheels	8.0
Mule carts or horse drawn carts	6.0
Pack animals and mules	2.0
Pedestrians walking on the link	0.2
Porters walking on the link	0.4

- 3.4 Composition of traffic is one of the key elements that determine the standard of a rural transport linkage. The length of the longest vehicle plying along the rural transport linkage would be one of the factors that define the geometric standards of the linkage. For example, the longer the vehicle wider the carriageway width is required at the bends.

- 3.5 Volume of traffic shall be considered while fixing the design standards of a rural transport linkage as the linkage needs to accommodate the estimated number of Transport Units. Traffic volumes are generally the Annual Average Daily Traffic (AADT). While fixing the design standards, however, the other factors like availability of funds, land use pattern of both sides and the restrictions imposed by the nature (forest, water ways, steep hill slopes, etc.) shall be considered. The more the number of traffic, wider is the carriageway width required as there would be frequent passing and overtaking manoeuvres.

4.0 Design Standards

- 4.1 **Design Capacity:** (Applicable only for Rural Road Class 'A' and 'B')

Design capacity (Design Service Volume) shall provide the basis for determining the class of the rural road. The rural roads are classified in Section 2.3 on the basis of connectivity. However, in order to ensure the serviceability of the road, the class may change depending upon the volume of traffic (counted or projected). For example, a road classified as 'B' on the basis of connectivity might be changed into a class 'A' road, if the volume of traffic is found to be higher. Design capacity shall further provide the criteria for determining the intervals of lay-byes (passing zones).

4.2 **Design Speed:** (Applicable only for Rural Road Class 'A' and 'B')

When the design speed is higher, the design standards should be of higher order which ensures the road safety, capacity, comfort and decreases the users' operational expenditure. The choice of design speed, however, would be influenced by the class of road, traffic volume, available budget and the terrain.

4.3 **Terrain:** (Applicable only for Rural Road Class 'A', and 'B',)

The terrain through which the rural transport linkage passes directly influences the selection of geometric standards (formation width, carriageway width, right of way, free board, radius of horizontal curves, gradient, intervals of passing zones, etc.). Depending upon the terrain, the factors such as land use pattern of either sides, availability of land, the restrictions imposed by the nature (forest, steep hill slopes, rapid-flow water ways, complex geological structure, etc.) would vary considerably thereby governing the choice of many geometric standards. For example, a road in hills may suffer due to the limitation in land availability whereas a road in Terai may not face such difficulty.

4.4 Design Standards: (Applicable only for Rural Road Class 'A' and 'B')

Below mentioned standards shall be followed while designing the rural transport linkages.

S. No.	Design Parameters	Class 'A'		Class 'B'		Class 'C'
		District Road		Village Road		Main Trail
		Hill	Terai	Hill	Terai	
1.	Design capacity- in both directions (Vehicle per day/T.U per day)	200 (400)	400 (800)	100 (200)	200 (400)	
2.	Design speed (km per hour)	20	40	15	30	
3.	Right of way, either side from the road centre (m)	10	10	7.5	7.5	2.5
4.	Formation width (m) - includes 0.6 m drainage & 0.4m parapet which will be kept wherever needed.	5.0	6.0	4.0	4.5	2.0
5.	Carriageway width (m)	3.0	3.0	3.0	3.0	2.0
6.	Shoulder width, either side (m)	1.0	1.5	0.5	0.75	0
7.	Paving the earthen surface by	Broken stones or Gravel	Gravelling or Brick Soling	None	None	None
8.	Minimum radius in horizontal curve (m)	10	20	10	20	
9.	Maximum average gradient (%)	8	5	8	5	
10.	Maximum gradient (%)	12	7	12	7	
11.	Easing of gradient for every 500 m increment in altitude (rate of easing)	0.50	-	0.50	-	
12.	Minimum gradient on hill roads (for better drainage) (%)	1	-	1	-	
13.	Free Board from HFL (m)	0.5	0.5	0.5	0.5	0.5
14.	Minimum stopping sight distance (m)	20	40	15	30	
15.	Cross slope in carriageway camber (%)	4	4	5	5	

S. No.	Design Parameters	Class 'A'		Class 'B'		Class 'C'
		District Road		Village Road		Main Trail
		Hill	Terai	Hill	Terai	
16.	Cross slope in shoulder camber (%)	5	5	5	5	
17.	Carriageway width at culvert/bridge* (m)	3.0	3.0	3.0	3.0	2.0
18.	Dimensions (width x length) of Lay-byes/passing zones (m x m)	3.0 x 20	3.0 x 20	3.0 x 20	3.0 x 20	
19.	Lay-byes/passing zone strips at interval of (m)	300	500	300	500	

*.....Suspension or suspended bridges are not considered.

Annex I-3

FORMATS 'A' (1)
Inventory of Rural Transport Linkages
(Existing)

FORMATS 'A' (1)
Inventory of Rural Transport Linkages
(existing)

1. Name of Transport Linkage:
2. Total Length (km) :.....
3. Type of transport Linkage: () District Road () Village Roads
 () Agriculture Roads

4. Route description

Start point	End point	Name of Settlements Passes through	Vehicle Operating Length (Km.)	Vehicle Reached Place	Seasonal / All Weather Road

5. Detail Survey () Yes () No
6. Date of Construction:
7. Type of construction for earthwork: () Labour Based () Bulldozer ()
 Others
8. Funded by: () VDC () DDC () DoR () Donor specify () Community contribution
9. Implemented by: () VDC () DDC () Local NGO () DoR
10. Serviceability: Impassable (KM) easily passable (KM).....
 Passable with difficulty and risk (KM)

Annex I-3.2

FORMAT 'A' (2.1)

**Rural Road Inventory Form A (Road alignment)
(Existing)**

FORMAT 'A' (2.1)
Rural Road Inventory Form A (Road alignment)
(Existing)

Road Name:

Start place:

District:

Road class/code:

End place:

Date:

VDCs touched:

S.N.	Road section				Length (km)	Formation width (m)	Surface type			Service ability		Surface condition*	Intervention required (for all weather access)	Remarks
	From		To				Earthen	Gravel	Blacktop	All weather	Fair weather			
	Waypoint	Odomete	Waypoint	Odomete										

Note: Surface condition*: Good (G), Fair (F), Poor (P)

Annex I-3.3
FORMAT 'A' (2.2)

FORMAT 'A' (2.2)

Inventory of Rural Transport Linkages (Road structure)

(Existing)

Road Name:

Road class/code:

S. N.	Structure		Structure type*	Span/Length (m)	Material type**	Structure condition	Intervention required	Potentially required		Remarks
	ID (Waypoint)	Chainage (Odometer)						Structure type*	Span/Length (m)	

Note: Structure type : Slab culvert, Bridge, Causeway,

Material: Type**: Bridge: Wooden (W), Truss (T), RCC (R)

Causeway: Concrete (C), Masonry (M), Gabion (G)

Structure Condition: Good (G), Fair (F), Poor (P)

Annex I-3.4
FORMAT 'A' (3)

FORMAT 'A' (3)
TRAFFIC VOLUME COUNT BY MOC METHOD

District:

Name of Road:

Total Time Taken:

Type of Vehicle	Daily Traffic Volume (no), please count the traffic during the to and fro along the road			Remarks Average Daily Traffic Volume as per key informants (Bus Park/Shopkeeper/other
	X	Y	Z	
Pedestrian				
Porter				
Pack Animal/Mule				
Bicycle				
Rickshaw				
Car/ Jeep/ Van				
Motorcycle				
Carts				
Light Truck				
Truck				
Heavy Truck				
Tractor				
Mini Bus				
Bus				

Where:

HT = hourly traffic

x = vehicles travelling in opposite direction

y = vehicles overtaking the observer

z = vehicles overtaken by the observer

t = time in hours

DT = Daily traffic

Annex I-3.5
FORMAT 'A4'

Annex I-4
Questionnaire 'A'

Questionnaire 'A'
For Conducting Rapid Rural Appraisal Survey on Socio-economic Benefit
Of
Proposed Transport Linkage for New Construction
(This Questionnaire should be used for each proposed linkage separately)

A. PROJECT IDENTIFICATION

1. Name of Transport Linkage:

2. Type of transport Linkage: () District Road (RRA) () Village Roads (RRB)

3. (a) Rout description

Start point	End point	(W.No. including Settlement's name.)/VDC within the influence area (2 hours in terai/4 hours in Hill/6 hour in mountain)	(W.No. including Settlement's name.)/VDC within the influence area (2 hours in terai/4 hours in Hill/6 hour in mountain)	Directly connected to another existing roads (name of the road)

(b) Map or sketch of the location and service area

- Using PRA, draw a sketch in a separate page (or on the overleaf of this page) showing the route of transport linkage, main settlements, important natural and man-made features in the influence area. (Also mark these on a topographical map if available, preferably on 1:50,000 or 1:25,000 scale topo maps.)

B. GENERAL SOCIO-ECONOMIC SITUATION OF THE INFLUENCE AREA

4. Overview of settlements in the influence area influence area (2 hours in terai/4 hours in Hill/6 hour in mountain)

Code	VDC	Ward Number (including name of settlements)	Population			Walking Hours to reach proposed road	Cultivated land (ha.) (1 ha. = 1.48 bigha 1 bigha= 13 ropani)
			Whole Ward	Dalit	Janajati		
A	Rampur VDC	(W.N.-5 Ramkot Village, Krishnapur, Hansapur,)	Pop= 1350	(e.g. Pop=250)	(e.g. Pop= 1150),	2 hours	30 ha.
B							
C							
D							
E							
F							
G							
H							

Source of Information: VDC office/records of other VDC level offices (e.g. Agri. Service centre) or other key informants from Illaka level workshop.

5. Food Availability within the influence area

Food Availability	Code (settlement in ward align with the road), unit in HH Nos.							
	A	B	C	D	E	F	G	H
Surplus								
Sufficient for Whole Year								
Sufficient for six months								
Sufficient for Three Months								
Hand to mouth								

Source of Information: VDC office/records of other VDC level offices or other key informants from Illaka level workshop.

6. EXPECTED CHANGES DUE TO THE PROJECT

.....

Name of the Surveyor

Date:

.....

Signature

Annex I-5
Questionnaire 'B'

Questionnaire 'B'

For Conducting Rapid Rural Appraisal Survey on Socio-economic Benefit

Of

Proposed Transport Linkage for Rehabilitation/Upgrading

(This Questionnaire should be used for each proposed linkage separately)

A. PROJECT IDENTIFICATION

1. Name of Transport Linkage:
2. Total Length (km):.....
3. Type of transport Linkage: () District Road (RRA) () Village Roads (RRB)
4. Required Intervention: () Rehabilitation () Upgrading
5. Route description

Start point	End point	Passes through	Vehicle Operating Length Km.	Vehicle Reached Place	Season (Fair weather/All Weather)

6. Serviceability: Impassable (KM) easily passable (KM).....
Passable with difficulty and risk (KM)

B. GENERAL SOCIO-ECONOMIC SITUATION OF THE INFLUENCE AREA

7. Market/service centre within the influence area of transport linkage

S.N.	Name of Market centres	Population
1		
2		
3		
4		
5		
6		
7		
8		

8. What are the average daily volumes of following mode of transport?

Mode of Transport	Average Daily Volume (passing/day, two way)	Remarks (estimate annual volume and indicate peak and slack periods)
Pedestrian		
Porter		
Pack Animal/Mule		
Bicycle		
Rickshaw		
Car/ Jeep/ Van		
Motorcycle		
Carts		
Light Truck		
Truck		
Heavy Truck		

9. EXPECTED CHANGES DUE TO THE PROJECT

.....

Date:

Name of the Surveyor

.....

Signature

Annex I-6
Questionnaire 'C'

Questionnaire ‘C’

Market Survey

For Group Discussion (Shop keepers, teachers, leaders, women, Socially Excluded Group, Differently Able persons, Third Sex, Aged and youth group)

Interviewer:.....Market Centre:.....

Date:.....VDC.....

Time..... Ward No:.....

Village.....

Market Type: () Weekly () Permanent () Other Specify.....

Total Population of the Market Centre:

Total Household of the Market Centre:

1.

S.N.	Name of the road/trail	origin	Destination	Length of the road/trails (km)	Numbers of days in year the road/trail is open to for transportation

2 Which Month in a year is access to this market very essential?

Month	Reason	Problem at that time

3. From which village do customers come for shopping?

5. Can you give information of existing and potential services and infrastructures at the market/service centre?

S. No.	Service/Infrastructure	Number of functions	
		Existing	Potential (up to 15 years)
	Category		
1	EDUCATION		
1.1	Campus (no)		
1.2	High School (no.)		
1.3	Primary School (no.)		
2	HEALTH		
2.1	Hospital (no.)		
2.2	Health Post (no.)		
3	BUSINESS & COMMERCE		
3.1	Hotels & Lodges (no.)		
3.2	Restaurants & Tea Stalls (no.)		
3.3	Grocery Shops (no.)		
3.4	Hardware Shop (no)		
3.5	Medical Shop (no)		
3.6	Clothes/readymade shop (no)		
3.7	Household goods		
3.8	Stationery		
4	INDUSTRY		
4.1	Rice & flour Mills (no.)		
4.2	Water mill (no)		
4.3	Textile (no)		

S. No.	Service/Infrastructure	Number of functions	
		Existing	Potential (up to 15 years)
	Category		
4.4	Forest Best Industry (no)		
4.5	Handicraft (no)		
4.6	Mechanical/Fabrication (no)		
4.7	Agro-based (no)		
5	Offices		
6.1	Bank (no.)		
6.2	Agriculture Service centre no		
6.3	Veterinary office (no)		
6.4	Post office (no)		
6.5	Telephone office (no)		
6.6	Electricity office (no)		
6.7	Cooperatives office (no)		
6.9	NGO (no)		

Annex I-7
GUIDELINES 'B'

GUIDELINES 'B'

For preparing District Inventory Map of Rural Transport Network (DIM)

A. Objective:









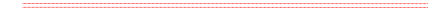



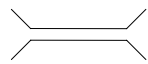
The objective of District Inventory Map of Rural Road Network is to show all existing rural roads and structures and their present conditions.

B. Steps:

1. Collect the secondary information of existing rural transport linkage like road, trail, Trail Bridge, cable car, tuin, ropeways etc.
2. Collect the coordinate of existing road alignment and road structure using GPS instrument. The coordinate should be taken using track mode for the alignment and point mode for the important structure.
3. Collect technical data and traffic Volume of existing road using FORMAT 'A'.
4. Identify the class of each rural transport linkage by using NEPAL RURAL ROAD STANDARD (2055).
5. Prepare the database of transport linkage using the filled format.
6. Identify the intervention (rehabilitation, upgrading or periodic maintenance) required by each linkage by using "Criteria A".
7. Export the collected coordinate of existing road, road structure and Trail Bridge in GIS based map.
8. Overlay all the existing transport linkage on the approved Indicative Development Potential Map by using the below mentioned legend.

C, Legend:

The symbols given in the next page are recommended for use while preparing District Inventory Map (DIM), Perspective Plan of District Rural Road Network and District Transport Master Plan (DTMP).

<u>Legend</u>	<u>Symbol</u>
◆ Rural Road Class 'A' : District Road -A - needs no intervention	
◆ Rural Road Class 'A' : District Road -A - needs rehabilitation	
◆ Rural Road Class 'A' : District Road -A - needs periodic maintenance	
◆ Rural Road Class 'A' : District Road -A - new construction	
◆ Rural Road Class 'B' : District Road B - needs no intervention	
◆ Rural Road Class 'B' : District Road B - needs rehabilitation	
◆ Rural Road Class 'B' : District Road B - needs upgrading	
◆ Rural Road Class 'B' : District Road B - needs periodic maintenance	
◆ Rural Road Class 'B' : District Road B - new construction	
◆ Rural Road Class 'C' : Main Trail	
◆ Cross-drainage structures - need no intervention	
◆ Cross-drainage structures - need intervention	
◇ Cross-drainage structures - new construction	

- ◆ These symbols should be used when preparing the **District Inventory Map of Rural Road Network**.
- ◇ These symbols should be used when preparing the **Perspective Plan of District Rural Road Network**.

Coding of Rural and Agricultural Roads

The following guidelines shall be followed when coding a rural or an agricultural road. Each transport linkage will have a seven-digit code unique for a particular linkage.

- **First two digits (numbers varying from 01 to 75)** represent the district.

2 4 □ □ □ □ □ Kavrepalanchok

- **Third digit (a letter from A to E)** indicates the class of transport linkage.

□ □ A □ □ □ □ Rural Road Class 'A' - District Road

- **Next three digits (numbers varying from 001 to 999)** represent the particular transport linkage.

□ □ □ 0 1 6 □ Khopasi - Taldhunga Road

- **Last digit (a letter R or A)** indicates whether the link is a rural road or an agricultural road.

□ □ □ □ □ □ R A Rural Road

- Therefore, the code of **Khopasi - Taldhunga Road** in Kavrepalanchok district is

2 4 A 0 1 6 R

3. The following legend shall be followed during the coding process.

First two digits - Refer to **Table 1**.

Third digit

A..... Rural Road Class 'A' - District Road

B..... Rural Road Class 'B' - Village Road

C..... Rural Road Class 'C' - Main Trail

D..... Rural Road Class 'D' - Rope Way

Last digit

R..... Rural Road

Table 1: Code Numbers for Districts

(In accordance with the DISTRICT CODES adopted by the Department of Roads)

Cod e No.	District	Catego ry	Cod e No.	District	Catego ry	Cod e No.	District	Category
EASTERN REGION			WESTERN REGION			FAR-WESTERN REGION		
Mechi Zone			Gandaki Zone			Seti Zone		
01	Taplejung	B	36	Gorkha	B	67	Bajura	C
02	Panchathar	B	37	Lamjung	B	68	Bajhang	C
03	Ilam	B	38	Tanahun	A	69	Achham	B
04	Jhapa	A	39	Syangja	A	70	Doti	B
Koshi Zone			Dhaulagiri Zone			Mahakali Zone		
05	Morang	A	42	Mustang	C	72	Kanchanpur	A
06	Sunsari	A	43	Myagdi	C	73	Dadeldhura	C
07	Dhankuta	B	44	Parbat	C	74	Baitadi	B
08	Tehrathum	B	45	Baglung	B	75	Darchula	B
09	Sankhuwasava	B	Lumbini Zone					
10	Bhojpur	B	46	Gulmi	B			
Sagarmatha Zone			47	Palpa	B			
11	Solukhumbu	C	48	Nawalparasi	A			
12	Okhaldhunga	B	49	Rupandehi	A			
13	Khotang	B	50	Kapilbastu	A			
14	Udayapur	B	51	Argkhanchi	C			
15	Saptari	A						
16	Siraha	A						

CENTRAL REGION

MID-WESTERN REGION

Janakpur Zone			Rapti Zone		
17	Dhanusa	A	52	Pyuthan	B
18	Mahottari	A	53	Rolpa	B
19	Sarlahi	A	54	Rukum	B
20	Sindhuli	B	55	Salyan	B
21	Ramechhap	B	56	Dang	A
22	Dolakha	B			
Bagmati Zone			Bheri Zone		
23	Sindhupalcho wk	B	57	Banke	A
24		A	58	Bardiya	A
25	Kavrepalanch ok	A	59	Surkhet	B
26	Lalitpur	C	60	Dailekh	B
27	Bhaktapur	A	61	Jajarkot	C
28	Kathmandu	B			
29	Nuwakot	C			
30	Rasuwa	B			
	Dhading				
Narayani Zone			Karnali Zone		
31	Makawanpur	B	62	Dolpa	C
32	Rautahat	A	63	Jumla	C
33	Bara	A	64	Kalikot	C
34	Parsa	A	65	Mugu	C
35	Chitawan	A	66	Humla	C

Note : When entire road network is subjected to sub-classification according to the type of pavement, a **Eighth digit** shall be introduced to this coding system. **Eighth digit** may be a letter coded as **B** - Bituminous; **C** - Concrete; **E** - Earthen or **G** - Gravelled or WBM.

Annex I-8

CRITERIA 'A'

CRITERIA 'A'

To identify the rural transport linkages that need
MAINTENANCE, REHABILITATION and UPGRADING

A. General:

Criteria 'A' is used to identify the type of intervention (whether routine or periodic maintenance or rehabilitation or upgrading) required in the existing rural transport linkages (roads and trails).

The criteria for intervention are classified into four different types. They are:

- Maintenance (Routine maintenance and Periodic Maintenance)
- Rehabilitation or Upgrading

B. Criteria for Intervention

1. Criteria for Maintenance

1.1 Routine Maintenance

Routine Maintenance: All minor maintenance works which are of regular nature and could not be accurately estimated are categorized under routine maintenance. It covers the work involved in keeping the road in proper shape and maintaining the waterways free from debris, boulders, logs and other obstructions that are either placed by human beings or by natural causes. In general, only unskilled labor is involved in routine maintenance.

The following works are mostly considered under this heading:

- Cleaning of road surfaces.
- Cleaning of drains, waterways and openings of culverts and bridges.
- Trimming of road edges and slopes by cutting grasses, bushes and humps.
- Maintaining road signs and delineators.
- Removal of small and medium size slides/slips that fall on the road surface.
- Planting and maintaining trees along the road sides,
- Planting and maintaining the vegetative protections made at the landslide prone areas,
- Filling of potholes, ruts and run-off cuts.
- Any other minor works.

1.2 Periodic Maintenance:

Periodic Maintenance: All maintenance works that are of higher volume and to be carried out periodically shall be categorized under periodic maintenance. It covers the following types of work that are common in practice.

- Re-cambering and re-grading of the road surface when a single stretch is found to be less than 500 m long in earthen roads and less than 100 m in gravelled roads.
- Patch repair work of road surface when a single patch is found to be less than 10 m long in paved roads.
- When the total cost of following maintenance works does not exceed NRs. 80,000 per kilometer, such works are categorized under the periodic maintenance.
 - repairing the damaged portions of side drains;
 - repairing earth retaining walls (dry stone, masonry or gabion);
 - repairing parapet walls and railings at bridges and culverts;
 - repairing guard walls at road sides;
 - repairing works on abutments, wing walls or apron/cut-off walls at bridges and culverts.

If the total cost exceeds the given figure then some of the expensive works could be considered under the rehabilitation.

2 Criteria for Rehabilitation:

Rehabilitation: Routine maintenance and periodic maintenance programmes alone may not be sufficient all the time to keep the road in required standard. Upon heavy use, the road may be subjected to deterioration despite being maintained regularly. Sometimes, the unexpected natural causes such as landslides, earth quakes and floods may also contribute to deterioration or serious damage of the road, resulting a lower standard that in no way could provide the services anticipated at the design stage. When the rural transport linkage requires a greater intervention than that of maintenance, it shall be considered to take up as a rehabilitation project. The following works could be categorized under the heading of rehabilitation.

- Reconstruction of road pavements;
- Reconstruction or new construction of road structures;
- Improvement of drainage system;
- Newly identified slope stabilization works;
- Improvement of geometric standards of the road;

- Reconstruction of base or sub-base;
- Any other rehabilitation or reconstruction works than listed above

3. **Criteria for Upgrading:**

When a particular class of rural transport linkage meets the following criteria, it may be considered for upgrading.

- I. **Class 'B' road may be upgraded to class 'A' road** standard when,
 - i. the existing class 'B' road happens to be connecting a major Growth Centre or/and several VDCs with the headquarters of the same/neighbouring district,
 - ⇒ directly or
 - ⇒ through the National Strategic Road Network.

or/and
 - ii. the traffic volume on the road exceeds the design limit for class 'B' road as per Clause 4.4 of the Nepal Rural Road Standard (2055).
- II. **Class 'C' and 'D' roads i.e. Main and Village Trails** are not eligible for direct upgrading because they generally follow alignments having steep gradient, less right of way and sharp curves along with many other characteristics incompatible to the alignment of standard motorable road. Therefore, when a district is connected by National Strategic Road Network, such linkages have to be considered for new construction of **class 'A' or 'B' Roads** whichever applicable.
- III. construction of **class 'A' or 'B' Roads** whichever applicable.
- IV. Pavement of earth road to gravel road to make the fair weather road to all weather road.
- V. Pavement from gravel road to gravel/otta seal or black top road to cater the increased vehicle in the road.

Annex I-9

FORMAT 'B'

FORMAT 'B'

Validating Proposed Transport Linkage from Ilaka Level Workshop

1. Name of Ilakas (Ilaka No.) validating the proposed Transport Linkage:

.....

2. Type of transport linkages proposed and respective Order-of-Priority (Indicate the class, if known):

S.N.	Name of Transport Linkage	Length Km	Passes Through Settlement/ VDC	Type of Project (Tick <input type="checkbox"/> the appropriate box)		
				New	Upgrading	Rehabilitation
1				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Annex I-10

CRITERIA 'B'

CRITERIA 'B'

To prioritize the transport linkages for the proposed interventions

1. Prioritization of Rural Road Class 'A' and 'B'

The following criteria are used for prioritisation of District and Village Roads. Rank all the roads and prepare the lists according to the descending order of priority.

1.1 NEW CONSTRUCTION

S.N.	Parameter	Scoring Unit	Score
I	Population per unit Cost	Population/investment Cost in 100000	55
ii	Cultivated Land	Cultivated Land/km	15
iii	Population x Walking hour	Population x Walking hour /km	20
iv	Total Population of poor, Dalits and marginalized Janjatis.	Population /km	10

Calculation Method Scoring of Prioritization of New and Rehabilitation of roads:

In order to make the indicators comparable their results have to be transformed to dimensionless indices using the zero-to-one method.

The following formula is applied to each indicator of the area of investigation

(For high value ranking) $d = \frac{x - \text{min}}{\text{Max} - \text{min}}$ multiply by score

Max-min

Where,

d= transformed indicator

x= original indicator value

Max = maximum original value

Min = minimum original value

For each area of investigation, the road link with the highest indicator value 'd' results in '1' multiplied by the highest mark available under the relevant indicators.

(Note: to avoid possible confusion, the value of lowest score, zero is transformed by relating it to the value of second lowest score using pro-rata distribution method)

1.2 REHABILITATION

S. No.	Criteria	Scoring Unit	Score
1	Cost per Traffic Unit	cost /TU	70
2	Market /service centre (Based on Functional and Population)	Functional Index	10
3	Serviceability of the road	Easily Passable -0 Passable with Diificulty-10 Impassable -20	20
Total			100

1.3 UPGRADING

According to this APPROACH, only Village Roads are considered for upgrading to District Roads. When such roads are eligible for upgrading, they should be evaluated and prioritised together with the roads proposed for new construction.

**Annex II: Manning and Working
Schedule**

Manning Schedule for Preparing DTMP

S. No.	DESIGNATION	DURATION																								MAN Month		
		Month 1				Month 2				Month 3				Month 4				Month 5				Month 6				Office	Field	Total
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4			
1	Team Leader																									1.5	0.5	2
2	Engineer																									2.5	1.5	4
2	Socio-economist																									2.5	1.5	4
3	GIS Officer																									2	0	2
4	Technical Assistant-2																										114 (day s)	114 (days)
5	Research Associate-2																										114 (day s)	114 (days)

Working Schedule for Preparing DTMP

Task Name	Month-1				Month-2				Month-3				Month-4				Month-5				Month-6			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Field Mobilization	■																							
Coordination with DDC for District level workshop and collection of Socio-economic /Technical Data from primary and secondary sources,		■																						
Selection of Research Associate and Other Local Resource Persons and Orientation to them		■																						
District Level Workshop for Introduction of DTMP Preparation (Induction)		■																						
Coordination with DDC for Formation of DTICC or reformation			■																					
Carry out of market, traffic survey, inventory of existing road networks and Collection of source of possible budget				■	■	■	■	■																
Data Entry,data Analysis							■	■																
Preparation of Indicative Development Potential Maps (IDPM)								■	■	■														
Preparation of District Inventory Map of Road Networks (DIM)											■	■	■	■										
Preparation of Preliminary District Road network Plan and presentation and discussion with DTICC															■	■	■	■						

**Annex III: Tentative Budget for DTMP
Preparation**

Tentative Budget for DTMP Preparation

S.N.	Description	Unit	Number	Rate/Day	Amount, NRs.	% of Total Budget
A	Remuneration					
	Field Work					
1	Team Leader	Month	0.5			30
2	Engineer	Month	1.5			
3	Socio-economist	Month	1.5			
4	Technical Assistant-2	Day	114			
5	Research Associate-2	Day	114			
	Sub-Total					
	Office Work					
1	Team Leader	Month	1.5			35
2	Engineer	Month	2.5			
3	Socio-economist	Month	2.5			
4	GIS Officer	Month	2			
	Sub-Total					
B	Workshop Expenses (tea snacks & stationery)					
1	District Level Workshop	number	4			12
2	Illaka Level Workshop	L.S.	5			
	Sub-Total					
C	Maps					
1	Topo Maps (1:25000)	L.S.				2
2	Country map, Administrative Maps, District Maps, Trail Maps,	L.S.				
3	GIS Maps	L.S.				
	Sub-Total	L.S.				
D	GIS software and accessories					
1	GPS hiring	L.S.				13
	Sub Total					
E	Transportation					
	Sub Total					
F	Other Expenses					
1	Stationery	L.S.				8
2	Photocopy	L.S.				
3	GIS maps color printing and Photocopy (A3 size)	L.S.				
4	Report production	L.S.				
5	Communication	L.S.				
	Sub Total					

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Briefs on Village Roads (Salient Features, condition, required intervention, population served, existing development area served, other socio-economic benefits etc)

4.4

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