

FOREWORD

The PSU is privileged to have been of assistance to the participating districts of DRSP with the preparation of their district transport plans. It should be noted that the methodology described in this volume is a highly participatory one and that the districts were heavily involved with and controlled the process of plan preparation. All recommendations and road proposals for inclusion in both DTMP and DTPP were made at district or village level and the district authorities approved both this methodology and the results of its implementation.

The PSU was careful to transfer ownership to the districts at each step along the way towards district transport plan finalisation. The district transport plan is just as the name suggests. It is not a PSU plan or an SDC plan or a DRSP plan and it should not be considered to be part of a particular donor programme or programmes. Each district must be fully committed to the implementation of its district transport plan and must resist the temptation to expend transport resources on projects which are not included in its plan priorities. Likewise, it is hoped that donors and HMG ministries and departments will allocate resources for transport development within the framework of the district transport plans.

This methodology for district transport plan preparation is based on the methodology recommended in the Department of Local Infrastructure Development and Agricultural Roads (DoLIDAR)'s *“Approach for the Development of Rural and Agricultural Roads”* but it relies on substantial technical and logistic support to the districts from the PSU. Although this methodology has been prepared and refined with the benefit of actual field experience and numerous discussions with the district authorities, it is not recommended for general use by other districts unless they have access to technical support and external resources. However, where such support is available, particularly donor support, it is highly recommended that this methodology be employed for the production of district transport plans.

The role played by the PSU in the preparation of the district transport plans can easily be undertaken by other consultants or agencies provided that they have the necessary technical expertise and have access to the required logistics.

The preparation of this district transport plan methodology as well as the preparation of the various district plans was a team effort between the districts and the PSU and invaluable support and guidance was supplied by DoLIDAR. The PSU wishes to thank all concerned parties for making the process of plan preparation a success.

Programme Support Unit
District Roads Support Programme
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TABLE OF CONTENTS

PREFACE	1
1. INTRODUCTION	2
1.1 Transport Sector Background	2
1.2 Transport Sector Programmes and Policies	2
1.3 The Definition of "District Road"	3
1.4 Organisational Aspects of District Road Planning and Implementation	3
1.5 Objectives of District Transport Planning	6
2. DISTRICT TRANSPORT PLANNING APPROACH	7
3. PRIORITISATION OF ROADS	13
3.1 Indicators for Prioritisation	13
3.2 Scoring System	13
3.3 Scope and Limitation of DTMP/DTPP	15
3.4 Road Referencing Systems	16
3.5 Defining Zone of Influence of the Roads	16
3.6 Aggregation of Score	16
3.7 Indicators for District Transport Planning for New Construction Roads	16
3.7.1 <i>Demography (Indicator I)</i>	17
3.7.2 <i>Agricultural Resources/ Potential (Indicator II)</i>	18
3.7.3 <i>Economic Structure and Central Services (Indicator III)</i>	19
3.7.4 <i>Trade Flow/ Predicted Changes (Indicator IV)</i>	23
3.7.5 <i>Development Potential (Indicator V)</i>	24
3.7.6 <i>District Priority (Indicator VI)</i>	25
3.7.7 <i>Tentative Construction Costs of Proposed Roads (Indicator VII)</i>	26
3.7.8 <i>Environmental Issues/ Predicted Impacts (Indicator VIII)</i>	28
3.7.9 <i>Social Issues (Indicator IX)</i>	29
3.8 Aggregation of Scores from all Nine Scoring Indicators	30
3.9 Parameters used for Prioritisation of Existing Roads for Rehabilitation	30
3.9.1 <i>Population within the Area of Influence of the Road (Indicator I – 10% weight)</i>	31
3.9.2 <i>Agricultural Exports (Indicator II – 10% weight)</i>	31
3.9.3 <i>Market/Service Centres (Indicator III - weight 10%)</i>	32
3.9.4 <i>Traffic Movements (Indicator IV – weight 25%)</i>	33
3.9.5 <i>Rehabilitation Costs (Indicator V – weight 25%)</i>	33
3.9.6 <i>Maintenance Costs (Indicator VI – weight 20%)</i>	34
3.10 Funding Sources for the DTMP Implementation	36
3.10.1 <i>HMG</i>	36
3.10.2 <i>National Road Fund</i>	37
3.10.3 <i>DDC Internal Sources of Funding</i>	37
3.10.4 <i>Donor Funding</i>	37
3.10.5 <i>Local Contributions</i>	37
3.11 Matching of Resources on High Ranked DTMP Roads	37
3.12 Preparation of DTPP	38
3.13 District Transport Plan Implementation	39

LIST OF FIGURES

Figure 1.1:	Organisational Structure of District-Level Decision-Making and Implementation	5
Figure 2.1:	Approach for Preparing DTMP and DTPP	8
Figure 2.2:	Long-Term Planning Cycle	12
Figure 3.3:	Existing Trade flow (Example from Okhaldhunga district).....	23

LIST OF TABLES

Table 3.1:	Scoring system for prioritisation of the proposed roads for new construction	14
Table 3.2:	Scoring system for prioritisation of the individual existing roads for rehabilitation	14
Table 3.3:	Population in the influence area of a single road link (example from Bastipur-Nepalthok road section in Sindhuli district).....	17
Table 3.4:	Scores of proposed roads based on demographic characteristics (example from Sindhuli district)	18
Table 3.5:	Scores of proposed roads based on agricultural resource base (example from Sindhuli district)...	19
Table 3.6:	Functional characteristics of existing market/service centres (example from Sindhuli district)....	19
Table 3.7:	Weightage for economic and services facilities in the main market/service centres	20
Table 3.8:	Central analysis of main market/service centres and their area of influence (example from Sindhuli district)	22
Table 3.9:	Aggregate scores of proposed roads based on services provided by existing market/service centres (example from Sindhuli district)	22
Table 3.10:	Average transport cost of the proposed road (example of Hatpate - Sirthauli road from Sindhuli district)	24
Table 3.11:	Scores of proposed roads based on volume of trade flow (example from Sindhuli district)	24
Table 3.12:	Development potential per road corridor (IZI and OZI) (example from Sindhulimadi Bhimasthan road in Sindhuli district)	25
Table 3.13:	Scoring of development potentials within the areas of influence (IZI and OZI) (example from Sindhuli district)	25
Table 3.14:	Scores of proposed roads based on district priorities (example from Sindhuli district)	26
Table 3.15:	Components of initial cost estimate.....	26
Table 3.16:	Summary and breakdown of project cost (example from Sindhuli District)	27
Table 3.17:	Summary of initial costs and engineering rating of proposed roads (example from Sindhuli district).....	28
Table 3.18:	Summary of environmental rating of proposed roads (example from Sindhuli district)	29
Table 3.19:	Population effected by poverty in the influence area of the proposed road (example from Sindhuli district)	30
Table 3.20:	Prioritisation of individual road corridors (example from Sindhuli district)	30
Table 3.21:	Prioritisation of roads for rehabilitation based on population served (example from Sindhupalchowk district)	31
Table 3.22:	Prioritisation of roads for rehabilitation based on value of agricultural aspects (example from Sindhupalchowk district)	32
Table 3.23:	Prioritisation of roads for rehabilitation based on market service sentre analysis (example from Sindhupalchowk district)	33
Table 3.24:	Prioritisation of roads for rehabilitation based on rehabilitation cost per km of road length (example from Sindhupalchowk district).....	34
Table 3.25:	Maintenance costs on each proposed road for rehabilitation (example from Sindupalchowk district).....	35
Table 3.26:	Comparision of maintenance cost scores (example from Sindupalchowk district)	35
Table 3.27:	Prioritisation of existng roads for rehabilitation (example from Sindupalchowk district)	36
Table 3.28:	Physical and financial plan for DTMP roads (example from Sindhuli district).....	39

ABBREVIATIONS

APP	Agricultural Perspective Plan
DDC	District Development Committee
DoLIDAR	Department of Local Infrastructure Development and Agricultural Roads
DoR	Department of Roads
DoTM	Department of Transport Management
DRCC	District Road Coordination Committee
DRF	District Road Fund
DRSP	District Roads Support Programme
DTMP	District Transport Master Plan
DTO	District Treasury Office
DTPP	District Transport Perspective Plan
EIA	Environmental Impact Assessment
EPA	Environmental Protection Act
GIS	Geographic Information System
HMG/N	His Majesty's Government of Nepal
IEE	Initial Environmental Examination
IZI	Inner Zone of Influence
LDO	Local Development Officer
LRCC	Local Road Coordination Committee
LRMP	Land Resource Mapping Project
MoLD	Ministry of Local Development
MP	Member of Parliament
NPC	National Planning Commission
NRF	National Road Fund
OZI	Outer Zone of Influence
PRRA	Participatory Rapid Rural Appraisal
PSU	Programme Support Unit
RCIW	Rural Community Infrastructure Works
RRA	Rapid Rural Appraisal
SDC	Swiss Agency for Development and Cooperation
STOL	Short Take Off and Landing
VDC	Village Development Committee

PREFACE

In 1999 His Majesty's Government of Nepal (HMG/N), the Ministry of Local Development (MoLD), and the Department of Local Infrastructure Development and Agricultural Roads (DoLIDAR) approved the *Approach for the Development of Rural and Agricultural Roads*. The District Roads Support Programme (DRSP) has adopted this approach in principle. However, some steps are modified and adjusted. The methodology has been made more participatory by making District Development Committees (DDCs) and the Village Development Committees (VDCs) more involved in the process of planning and decision making.

This document can be used as a guide and as a reference when preparing the District Transport Master Plans (DTMP) and District Transport Perspective Plans (DTPP). The content has been divided into the following volumes:

Volume I	DTMP / DTPP, Methodology (general document)
Volume II	DTMP / DTPP, Main Report and Maps (district specific)
Volume III	DTMP / DTPP, Annexes (district specific)

Volume I describes the general methodology as applied to all District Transport Plans which were prepared through DRSP and is based on the following elements:

- The selection of relevant indicators and a scoring system for the final evaluation of proposed road links;
- A clear distinction between the existing situation and trends or potential considerations;
- The separation of demands and needs;
- Network considerations;
- Procedural and organisational aspects.

The concept and the scoring system for the preparation of the DTMPs / DTPPs is based on the above elements. Figure 2.1 describes the individual steps.

It is essential to distinguish the existing facts, such as present trade flows or market/service centres from any potential for development.

Facts are used as indicators and enter the final evaluation via the scoring system. Trends are measured by comparisons over time, e.g. the population changes between 1981 and 2000. Potentials are derived from secondary data and observations in the field. Consulting the respective district authorities can also identify areas of potential.

Trends and potentials are more descriptive and often depend on estimates projected into the future. They enter the scoring as gross categories of low, medium and high significance.

The indicators are aggregated on distinct areas of influence so that they allow for the evaluation of isolated road links and conclude with a list of alternatives and priorities. In contrast, any network considerations of the entire road network are based on a regional or national overview.

Volume II presents the applied data and maps for the DTMP and DTPP of each participating district. The final results according to the scoring are summarised in a map of scale 1:125,000 or 1:100,000 which is attached to Volume II.

Volume III contains all supplementary tables and figures, which support the findings of Volume II.

1. INTRODUCTION

1.1 Transport Sector Background

A review of the transport history of Nepal reveals that the first highway networks were very rudimentary; they only linked a few centres to each other including some gateways to India such as Raxaul. By 1975 sections of the East-West Highway existed but often they were without bridges. This situation caused isolated growth of some important centres such as Biratnagar and Dharan, which were separated from the other centres. In the late eighties the East-West Highway was nearing completion and traffic flows between the main centres of commercial activity became more regular. As observed in the Terai, the growth in traffic volume can have a major influence on the development of market centres and the converse is also true.

In the early stages, rural access within the mid-hill regions was only provided by trails, STOL airstrips and by road transport along a few highways. During this period of poor transportation facilities, predictions of traffic volume and the impact of roads was frequently underestimated. As a result, in the eighties, new feeder roads such as the Lamosangu-Jiri were controversial, and were sometimes heavily criticised for being uneconomical. However, the Jiri road has shown that the beneficial impact of the road only starts to become visible after an operation period of approximately ten years.

On the basis of growing demand a number of bilateral and multilateral donor agencies have become involved in rural road construction. At the same time numerous local initiatives to construct district and village roads using local resources, including free labour contributions are on-going. The strategic road network, i.e. highways and feeder roads, along with the district road network has expanded rapidly over recent years. To enable better co-ordination and to streamline the planning process, the need for new instruments such as the DTMP and DTPP has become apparent. It is obvious that new strategic roads influence the orientation of the district road networks and that new district roads which very often follow the alignment of previous main trails, influence the pedestrian trail connections. Main trails originally functioned as long distance routes linking the major rural centres, however in the mid-hills these are now becoming short connections as they are replaced by motorable roads. Hence, this transition process of rural accessibility strongly calls for sound planning and reorganisation of management structures at district and central levels.

1.2 Transport Sector Programmes and Policies

The National Planning Commission (NPC) of HMG/N has reiterated the decentralisation policy in the Eighth Five Year Plan (1992-1997). The aim is to delegate responsibility as well as authority for projects and programmes to local authorities. The Ninth Five Year Plan (1998-2002) declared poverty alleviation as the prime objective of HMG/N. It was formulated in line with the Agricultural Perspective Plan (APP), which focused on diversification, commercialisation and industrialisation of agriculture, and improving transportation facilities to the market/service centres. Despite these planning directives, few appropriate actions were taken until the Decentralisation Act became law in 1998. Since then priority has been given to the establishment of a strong administration in the districts, with effective links to the central government. DoLIDAR was set up under the Ministry of Local Development (MoLD) to coordinate the donor funded rural road/access programmes, and to give planning guidelines and technical support to the district authorities.

Since the beginning of its assistance to Nepal, Swiss involvement has focused on the transport sector including trail bridge and strategic road construction, rehabilitation and maintenance. Other bilateral as well as multilateral donor agencies were also heavily involved. In line with the Five Year Plans donor agencies are also very interested in participating in district road programmes that follow labour-based and environment friendly approaches.

1.3 The Definition of "District Road"

There is much confusion, even in the districts, concerning the characteristics which constitute a "District Road". The strategic network is much better defined but even here the list which the DoR considers to be a comprehensive record of highways and feeder roads has never been accepted as an exhaustive list by government and it must be considered as dynamic.

Legally, the responsibility for the management of a district road lies with the DDC of the district in which the road is located. However, the DDC can make arrangements with the VDCs through which a district road passes for assistance with the maintenance or the upgrading as necessary. The confusion exists in determining what is a district road and what constitutes a village road. This document has used a practical definition for a district road. It is primarily based on the definition given in the DoLIDAR's "Approach for the Development of Agricultural and Rural Roads". Although this document has followed the terminology and classification of roads as "Rural" or "Agricultural" it is felt that these descriptions have also contributed to the confusion surrounding the definition of a district road.

This document defines a district road as:

- All rural (incl. agricultural) roads not included in the strategic network that connect one or more major market/service centres (See note on Table 3.8) to the district HQ or which connect a major market/service centre, other than the district HQ, with the strategic network.
- or
- All rural (incl. agricultural) roads which are more than 10 km in length which connect at least three VDCs with the district HQ or with the strategic network.

Spur roads which connect a single VDC with a district road should not be considered as an extension of the district road.

The DTMP and the DTPP deals only with the ranking and prioritisation of district roads. The management of the strategic network is the responsibility of the DoR and the management of village roads and tracks is generally considered to be the responsibility of the concerned VDC even though some technical and financial support may be available from the DDC.

1.4 Organisational Aspects of District Road Planning and Implementation

Following the DoLIDAR policy and strategy, DRSP activities have been geared towards guiding and facilitating the DDCs in planning and implementing their district road programmes. The DDC is the main executive body in the district and it reports to the District Council. District Road Co-ordination Committees (DRCC) have been established through DRSP to provide support to the DDCs in formulating, managing and monitoring district level road and trail policies, rules and regulations. The DRCC is composed of the DRCC chairperson, who is usually the DDC chairperson and elected or nominated members from the DDC. Women and ethnic minority groups are represented as well as all geographic regions of the district and optionally, the private sector, such as the traders associations or farmers organisations. The DDC Secretary {Local Development Officer (LDO)} acts as a co-ordinator between the DRCC, its Implementation Body and the Technical Resource Pool. The Implementation Body links the local administration and user groups with the DRCC and the upper power structure of the district. Members of the Implementation Body could be from DoLIDAR as well as district engineers and overseers, non-profit organisations, community-based organisations and user groups. The Technical Resource Pool consists of the planning officer, the DoLIDAR engineer, the Women Development Officer and district officials from the various line offices. The Local Road Coordination Committee (LRCC) comprises of the respective Ilaka member as coordinator, the VDC chairperson and respective VDC women representatives. It is responsible for construction, maintenance and rehabilitation work on a local level and plays a leading role in securing funds from the DDC. As the main implementing body for long term maintenance, construction and operation of a particular road sector, it also has to facilitate the formation of

local user and labour groups and monitor the ongoing work carried out by the user committees and/or contractors.

DoLIDAR acts as the link between the district and the centre and it provides technical support to the districts as well as guidance on national policy and standards etc. The Programme Support Unit (PSU) of DRSP is an autonomous temporary organisation, which supports DoLIDAR and the districts in planning and implementing their transport programmes. Its main tasks are to co-ordinate, train, give technical support, facilitate exchange of information with other projects, monitor and develop policy and planning guidelines.

A crucial prerequisite for sustainability of DTMPs and DTPPs is a legally solid foundations in the democratic power structure and the government institutions. The plans should last beyond limited legislative periods. Because Nepal is still at an early stage of development, the process of decentralisation is yet to be developed to its full potential.

Figure 1.1 shows the institutional organisation at a district level in the context of district transport planning. It strongly reflects the participatory approach envisaged at all levels.

ORGANISATIONAL STRUCTURE OF DISTRICT-LEVEL DECISION-MAKING AND IMPLEMENTATION

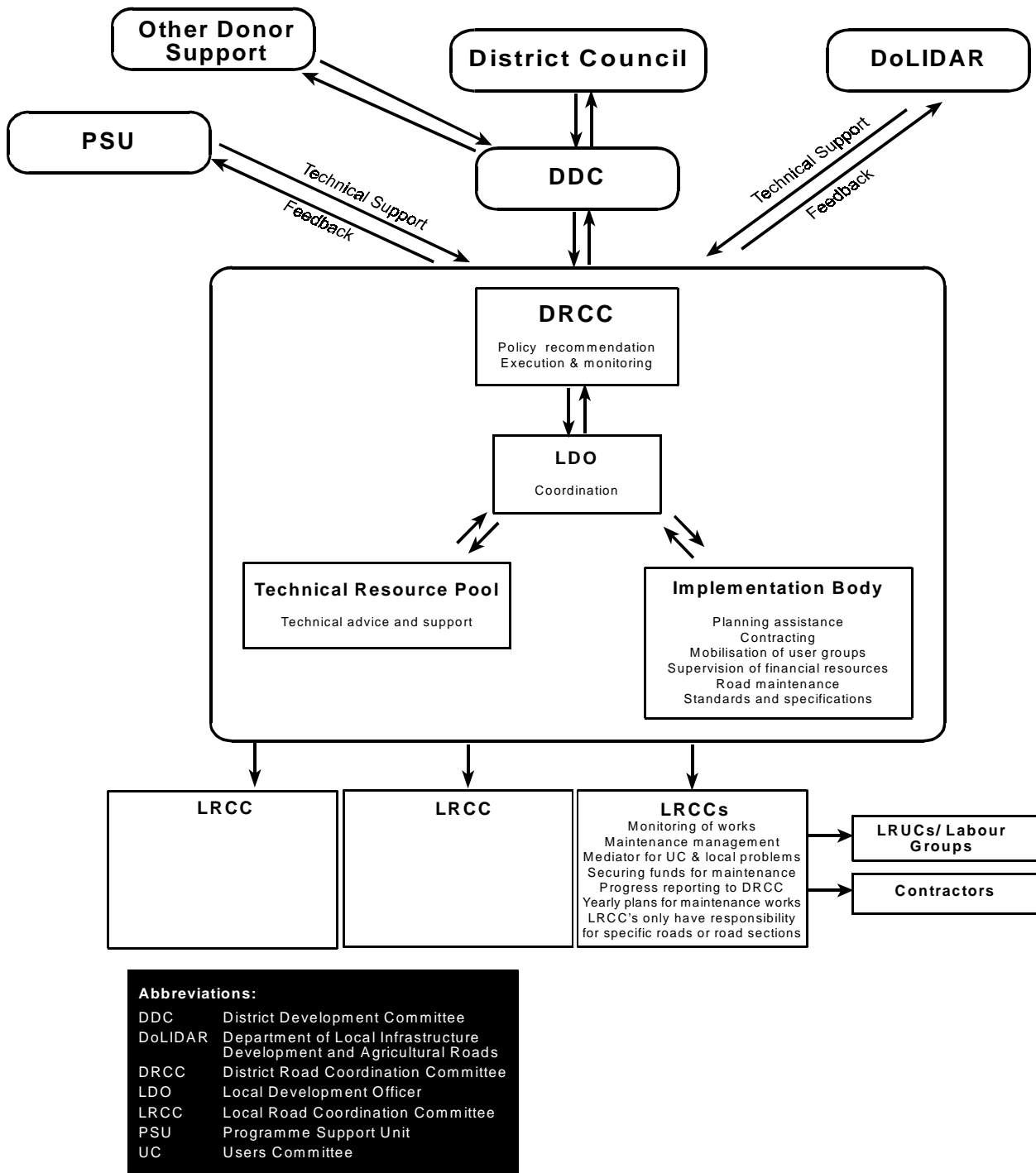


FIGURE 1.1

1.5 Objectives of District Transport Planning

The DTMP's objective is to facilitate and prioritise over a five-year plan period, accessibility to important centres and areas with resource potential and to guide the spatial arrangement of rural settlements, market/service centres of the district. The DTMP contributes to the development of a sustainable road network that reduces the aggregate transportation cost and minimises environmental impacts. The implementation of the DTMP/ DTPP will minimise the current ad-hoc practices of investing in roads based on short-term considerations and political contingency.

DTMP and DTPP provide the fundamental base for planning and implementing for new construction or for upgrading existing district roads. Investments in well-planned roads can lead to socio-economic transformations (though not uniformly) along road corridors over a period of time. Roads act as an economic growth axis in the district and provide the basis for a process of sustained growth.

2. DISTRICT TRANSPORT PLANNING APPROACH

The district transport planning cycle introduced by DRSP is characterised by its participatory approach. It involves all important stakeholders at the crucial stages of the planning process. Figure 2.1, shows the individual steps for preparing the DTMP and DTPP. This procedure has been tested and has proved to be feasible within the current institutional environment. It includes the organisation (formation of DRCC), finance (costs and funds) and operational planning aspects such as preparation of thematic maps at the PSU. However it also strongly emphasises the participation of the district institutions DRCCs/DDCs who make the key decisions. The VDC's are also involved through a series of workshops at Ilaka level. The endorsement of the District Transport Plans by DoLIDAR and NPC guarantees the link to the planning authorities at central level. This step allows the central authorities to synchronise and adjust their strategic road network planning by considering the intra-district, and to some extent the inter-district transport network from the approved DTMP's and DTPP's.

The steps shown on the flowchart in Figure 2.1 are described below in detail. The numbers are as shown in the boxes of the flowchart.

(1) Facilitate District Roads Coordination Committee (DRCC) Formation

The process starts in the district with the formation of the DRCC by the chairperson of the DDC. The PSU promotes the formation of the DRCC to ensure the involvement of the district in the entire planning, decision-making, programming and implementation process. The DRCC plays an advisory role in formulating policies related to planning and construction of roads and trails. (See Section 1.3)

(2) General Field Surveys

A General socio-economic assessment of the district is carried out to develop a better understanding of the existing socio-economic conditions and priorities of the district. This general assessment covers areas related to:

- Market/service centres, central places, central services
- Main trading routes;
- Existing agriculture production areas;
- Areas of future development potential;
- Inventory of existing roads and trails;

(3) Preparation of Thematic Maps

The district engineers and overseers supported by PSU staff are responsible for collecting and plotting the required information on available maps. They have to co-ordinate the tasks and complete the maps assisted by other resource people, such as line agencies, programme officers etc.

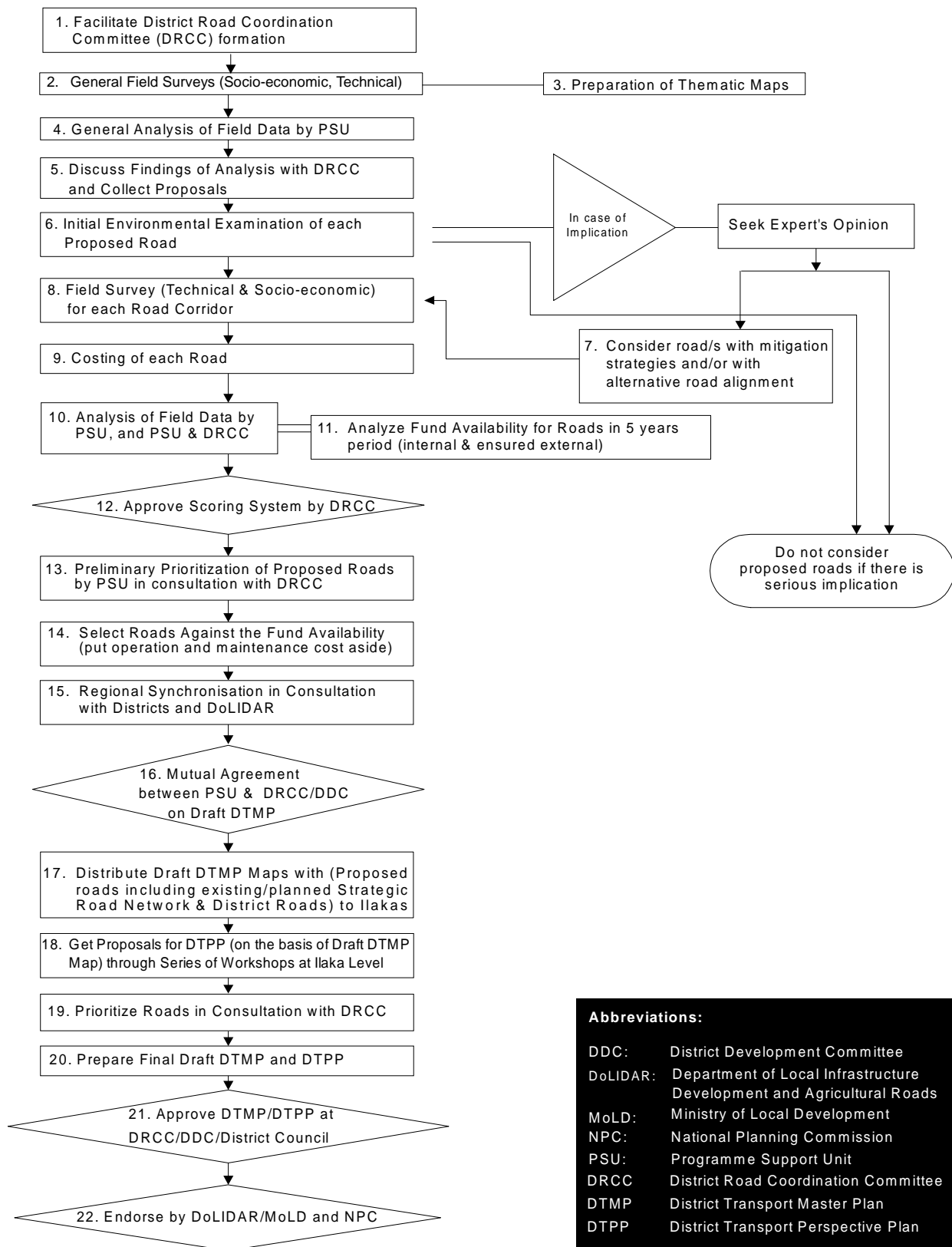
Based on the existing maps and data/information the following thematic maps are prepared:

- Transport Infrastructure and Location of District (country overview)
- District Road Inventory (strategic, district roads and main trails)

(4) General Analysis of Field Data

The data collected from the field survey is verified and analysed by the PSU with the help of the district engineer/s, officers and overseers. An assessment of the information collected at this stage is adequate for use in identifying potential areas for investments in roads. This information provides the basis for further discussion with the DRCC and the identification of roads that are to be recommended by DRCC for detailed study in the district. Regional synchronisation for roads that provide benefits to two or more districts is considered here. This aspect is considered further in step 15 of the flow chart. The social data analysis gives a general picture of the district in terms of access to health and education services and food availability/poverty. The overall analysis of the district level information in relation to transport planning gives a general overview of the district that will guide the district transport planning process. At this stage, an indicative development potential map of the district is prepared.

APPROACH FOR PREPARING DTMP AND DTPP



Abbreviations:

DDC:	District Development Committee
DoLIDAR:	Department of Local Infrastructure Development and Agricultural Roads
MoLD:	Ministry of Local Development
NPC:	National Planning Commission
PSU:	Programme Support Unit
DRCC	District Road Coordination Committee
DTMP	District Transport Master Plan
DTPP	District Transport Perspective Plan

FIGURE 2.1

(5) Discuss Findings of Analysis with DRCC and DDC and Collect Proposals

After the PSU has developed a good understanding of the general situation of the district and the potential areas for investments in roads, discussions are scheduled with the DRCC, usually in joint session with the DDC and other interested members of the district. This can involve members of the parliament, representatives from the political parties, line agencies at the district headquarters etc. The District (DRSP) Engineer then presents the findings of the general field assessment (social, economic and technical) to the DRCC for their review. Based on this, proposals for roads that have a high priority in the district are collected. Discussions with the DRCC and DDC are geared towards reaching a consensus or an endorsement of the potential roads that have priority for construction and rehabilitation in the district. Proposals for roads, which are not linked to existing road networks are discouraged. After developing an understanding with the DRCC, the DRCC puts forward the proposals for new roads or roads for rehabilitation to the DDC, for approval. PSU facilitates the DRCC in their presentation and discussion. At this point it is crucial that agreement is reached from as wide a representation as possible. This will facilitate approval of the DTMP and DTPP at a later stage. At this stage a map of proposed DTMP roads is prepared by the PSU.

(6) Initial Environmental Examination of Each Proposed Road

The Environmental Protection Act (EPA) 1996 of Nepal provides a basic legal framework for environmental considerations in developing rural transport networks. Under this framework, an Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA) is required to ascertain the viability of a project from an environmental point of view. Rural roads are generally localised and relatively short but they are still a part of the network. Therefore, they fall under the scope of the EPA. From the flow chart it is obvious that an IEE needs to be carried out for all proposed roads. It is usually expected that there will not be a need for further detailed environment studies i.e. EIA. If serious environmental implications are envisaged, the road proposal could be rejected, rather than be the subject of a costly and time-consuming EIA. The IEE is carried out according to fixed indicators. (See Section 3.7.8)

(7) Consider Roads with Mitigation Strategies

The construction of rural roads can have an adverse environmental impact, depending on the characteristics of the road corridors. Disturbance of fragile mountain slopes due to the construction of the road can trigger landslides and soil erosion especially during the monsoon. These associated environmental factors have to be analysed in greater depth. Some roads, on which there are environmental concerns, can in some cases, still be constructed by incorporating mitigation measures into the road design or by changing the alignment of the road. These roads are considered for further field survey. Other mitigation measures such as tree planting are also considered in the programme. Resettlement issues/policies related to land holding are also dealt with in a socially acceptable way at this step in the planning process.

(8) Field Survey

The engineer and overseers carry out a detailed socio-economic survey and engineering feasibility study of the proposed road corridors. Additional staff is assigned by the PSU to provide assistance in collecting social and economic data. The data collection forms are related to:

- Market/service centres;
- Agriculture development;
- Trade and traffic survey based on origin and destination survey;
- Engineering reconnaissance/feasibility study;

A reconnaissance/feasibility study of each road corridor incorporates a study of terrain, geology, slope stability, rivers, ponds, and lakes along the alignment. Alternative alignments are surveyed if technical difficulties are perceived along the proposed road alignment. Surveys are carried out in order to determine social indicators on each viable proposed road corridor. The

broad social indicators for the survey involve the number of households arranged by ethnic group in the main settlements/ VDC's served by the linkage data on livelihoods, poverty and population is compiled. At this stage the following thematic maps are produced:

- Zone of Influence of Proposed DTMP roads
- Land Use
- Existing trade-flow

(9) Costing of Each Road

An estimate is prepared to identify the preliminary construction/rehabilitation and maintenance costs of each proposed road. Construction costs for proposed new roads are estimated in a general way based on the data collected (annex III-2) during the walk over survey. Costs are prepared for fair weather earthen district road standard excluding the costs of bridges and culverts. The costing exercise is carried out jointly by the PSU and district staff.

(10) Analysis of Field Data

The analysis of the field data is carried out by the district road engineers with the support of the PSU. This analysis covers different aspects of the study such as demography, agriculture, market/service centres trade and traffic flow, potential future development sites, areas recognised by the DDC as areas for special consideration, social aspects and engineering aspects. The draft DTMP is prepared on the basis of the analysis. During this phase the scoring system (recommended in step 12) is put forward to district officials for discussion. This gives district officials adequate time to consider the parameters and the weightage of scores assigned to each parameter, before approval. This step makes the decision-making process more transparent.

(11) Analyse Fund Availability for Roads

The internal and external financial resources available in the district are reviewed by the PSU in discussion with the district authorities so that the financial resources available for road maintenance and construction/rehabilitation during the five year DTMP period can be estimated. Sources of funding include annual budget allocated in the district, the budget allocated through HMG central agencies such as DoLIDAR and DoR. Other possible sources of funds could be from road tolls, royalties, land taxes etc. Prospects of funding from other external sources, including possible and committed funding from donors are reviewed and taken into account.

(12) Approve Scoring System

One of the important components of the methodology is the scoring system required for the prioritisation of roads. The scoring system recommended by the PSU for the ranking of proposed roads is discussed with the DRCC and a mutual agreement is reached. The scoring system is then approved by the DDC. (For details of the scoring system see section 3.1).

(13) Preliminary Prioritisation of Proposed Roads

Based on the approved scoring system, the preliminary prioritisation of proposed roads is carried out by the PSU staff in consultation with the DRCC. A pro rata scoring system (See section 3.2) has been chosen because of the limited information available at this stage. After the field survey when the data becomes available the scoring basis is reviewed.

(14) Select Roads against the Fund Availability

Based on the five year projected funds availability the Financial Plan for the draft DTMP is prepared by the PSU. This step involves matching the estimated resources which are expected to be available to the district over the plan period with the roads recommended for construction and maintenance. If the funds available for the first five years are not sufficient for the construction of all roads prioritised in the draft DTMP, these roads which were omitted from DTMP will be included in DTPP and will continue to have priority for construction/rehabilitation during the DTPP implementation period. The matching of funds against prioritised roads is shown on a draft DTMP map which is produced as a part of this step.

(15) Regional Synchronisation in Consultation with Districts and DoLIDAR

Districts or regions do not exist in isolation. Trade and traffic flows often pass through two or more districts. Market/service centres in one district may provide services to the population from two or more districts and could be dependent on the agriculture surplus from another district. Although regional synchronisation is identified as step 15, it is started much earlier in the process (see step 4). The PSU is responsible for this and seeks guidance from DoLIDAR and from other HMG central agencies at a synchronisation seminar/meeting. Findings from synchronisation meeting are recorded on a regional map and are incorporated in the draft DTMPs. These mainly cover possible inter-district linkages that provide benefits to two or more districts.

(16) Mutual Agreement between PSU and DRCC/DDC

The completion of all of the above steps leads to the final stages in the preparation of the DTMP. The PSU discuss and finalises the draft DTMP with the DRCC. The DRCC then presents the draft DTMP to the DDC for their approval. In this process as many representatives as possible are included, such as party representatives, line agencies, Members of Parliament (MP) etc. The PSU supports the DRCC and DDC in getting consent from a wider audience and in making the draft DTMP transparent and broadly understood and accepted within the district. Based on the suggestions from the meeting and agreed changes for revision, the draft DTMP is modified.

(17) Distribute Draft District Transport Master Plan to VDCs

Relevant sections of the draft DTMP along with maps, are distributed to all VDCs for their information and consideration. The VDCs can suggest modifications to the draft DTMP and the draft document assists them to formulate their proposals for DTPP. The draft DTMP also includes strategic network roads, both existing and planned, over the next 5 years.

(18) Collect Proposals for DTPP through Series of Workshops at Ilaka Level

Proposed roads that will provide a base for the development of the district have already been identified in the draft DTMP. In addition to these, other roads that will provide access to these main roads over the longer term have to be identified. This is done through a series of workshops at Ilaka or group of Ilaka level (usually two or three Ilakas combined). Once identified, the DTPP proposed roads are then recommended for construction over a long-term period. These roads are included in the draft DTPP. DRCC/DDC members with the support of the PSU staff organise the workshops at Ilaka level. VDC chairpersons, VDC secretaries and women representatives are normally invited to participate. Care is taken to discuss all proposals from the VDC but through the guidance of the facilitators a consensus is reached on the most important proposals to be included in the draft. Based on the outcome of DTPP workshops, the proposed DTPP roads are shown in a map along with proposed DTMP roads.

(19) Prioritise Roads in Consultation with DRCC

The findings from the workshops are reviewed at the district level with the DRCC. These provide the basis for preparation of the long term DTPP and are shown on a map.

(20) Prepare Final Draft DTMP and DTPP

Based on the findings of the final analysis and above all the recommendations and interim approval of the VDC/DRCC/DDC, the final draft of DTMP and DTPP is produced by the PSU.

(21) Approval of DTMP/DTPP at DRCC/DDC

The final draft of the DTMP and DTPP is presented by the PSU to DRCC/DDC for approval. Subsequently, the DDC presents it to the District Council for formal approval. These documents provide the basis for medium term and long term transport planning.

(22) Endorse by DoLIDAR/MoLD and NPC

The final plans are submitted by DDC to DoLIDAR and NPC for their endorsement/concurrence.

Figure 2.2 represents the long-term planning cycle. It follows the principle of a rolling plan. Each phase is a summary of the overall procedure as given in Figure 2.1. As indicated, the DTMP is based on the facts of the present situation, using the approved scoring system to determine priorities. The DTPP on the other hand, focuses more on the potentials and predictions and is descriptive in character. Therefore the projections described in the DTPP are based on forecasts and are often not quantifiable. However, long-term planning is facilitated by including district outline plans and visions which are being discussed at the time of plan preparation. After 5 years, impacts have to be evaluated and comparisons made between predictions and the actual experience during the period of DTMP. At the time of plan review the validity and accuracy of predictions is assessed and appropriate adjustment are made in methodology for predictions as necessary. These corrections may be necessary because of modified trends observed by the changing perspectives. All planning aspects for the next five-year period within Phase II will be formulated in the revised DTMP for implementation. Phase III and all following phases will follow the same method.

LONG-TERM PLANNING CYCLE

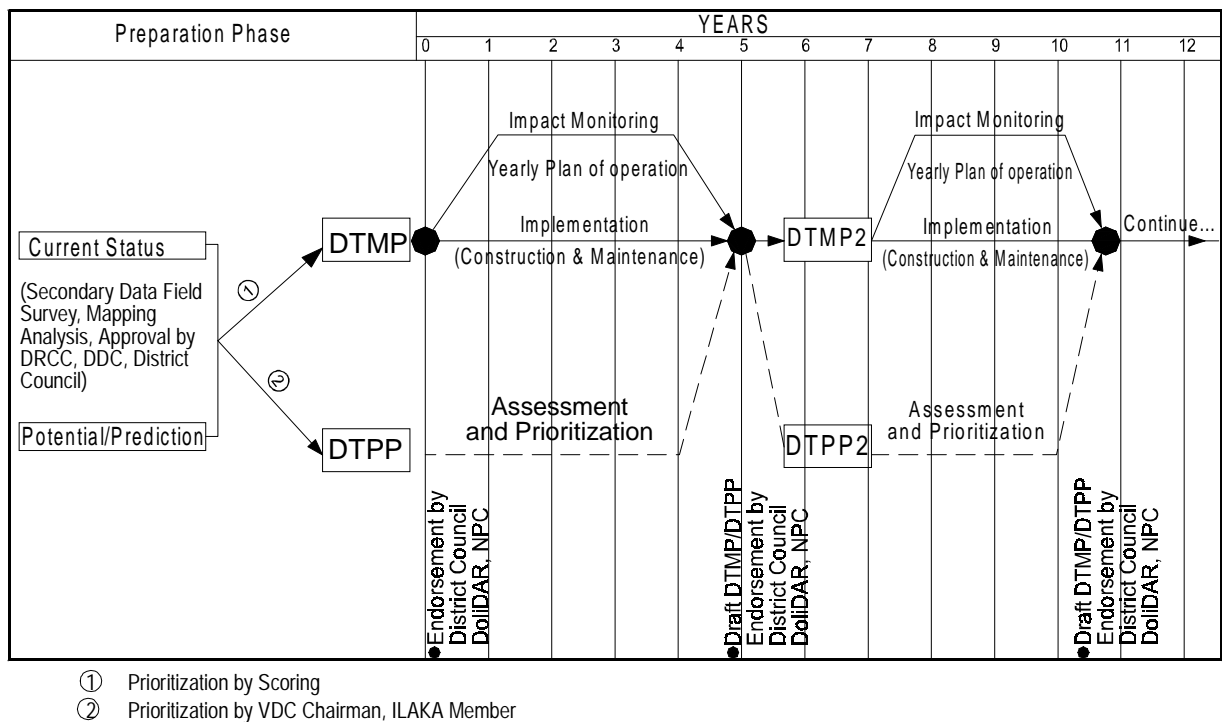


FIGURE 2.2

3. PRIORITISATION OF ROADS

This chapter describes in more detail the methodology of the scoring system approved by the DRCC/DDC. The methodology follows the principle of prioritising road links by the means of a ranking system with defined scores. Network considerations beyond the boundary of a particular district are dealt with separately during the process of regional synchronisation.

3.1 Indicators for Prioritisation

Nine major parameters are used for the prioritisation of district roads for new construction (See Table 3.1). The indicators are broadly based on socio-economic and technical data related to each individual road corridor; they are:

- Population
- Agricultural resource base
- Economic structure and centre services
- Trade flow
- Development potential
- District priority
- Construction cost
- Environmental issues
- Social issues

In the case of existing roads for rehabilitation and maintenance five major parameters are taken for prioritization purposes (See Table 3.2). They are:

- Population living within the influence areas of the road
- Export of cash crops
- Market/service centres in the influence areas of the road
- Vehicle /traffic movements
- Rehabilitation/maintenance cost per kilometre of road length

The parameters that are used for prioritisation of roads for DTMP are described in detail later in the chapter. (See Table 3.1)

3.2 Scoring System

The DTMP is mainly based on primary data gathered in the field. Whenever appropriate, secondary data, such as land use data has also been used.

The scoring system provides the basis for prioritisation of road corridors. The DRCC/DDC approves the scoring system as presented in Table 3.1 and Table 3.2 (step 12). The system is broadly based on the scoring system recommended by DoLIDAR in their Manual "Approach for the Development of Agricultural and Rural Roads".

Scoring system for prioritisation of the proposed roads for new construction

S. No.	Indicators	Score
I	Demography	6
	<ul style="list-style-type: none"> • Link providing service to large settlement areas/population in the Inner Zone of Influence (IZI) of the road • Link providing service to large settlement areas/population in the Outer Zone of Influence (OZI) of the road 	4
II	Agricultural Resource Base	10
	<ul style="list-style-type: none"> • Total agricultural land of the Inner Zone of Influence (IZI) • Total agricultural land of the Outer Zone of Influence (OZI) 	5
III	Economic Structure and Central Services	10
IV	Trade Flow	15
V	Development Potential	5
	The development potential is based on the evaluation given in Table 3.11. According to their significance 18 indicators define the overall potential of the Outer Zone of Influence (OZI) of a particular road link.	
VI	District Priority	5
	Link providing service to the areas recognised by the DDC as areas for special consideration, such as areas inhabited by backward and poor ethnic groups/communities, isolated remote areas, historic sites, religious sites etc.	
VII	Tentative Construction Cost per Road km.	20
VIII	Environmental Issues	10
IX	Social Issues	10
Total		100

TABLE 3.1**Scoring system for prioritisation of the individual existing roads for rehabilitation**

S. No.	Indicators	Score
1	Population within the influence area of the road	10
2	Agricultural Exports	10
3	Market/Service Centres in the influence areas of the road	10
4	Vehicular/Traffic Movements	25
5	Rehabilitation Costs	25
6	Maintenance Costs	20
Total		100

TABLE 3.2

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

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

(for high values ranking best)
$$d = \frac{x - \min}{\max - \min} \text{ multiplied by score}$$

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, variable 'd' results in '1' multiplied by the highest mark available under the relevant indicators as shown in Table 3.1. The other roads will then be assigned scores on a pro rata basis between 0 and the maximum. The total score for each road link is then compared and assembled in the overall ranking table.

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 Table 3.3 (population) have been used to show examples of the calculation.

Road Corridor	IZI (Pop/km)	Max. Score	Calculation	Stand. score	Transformed score
Okhaldhunga- Rampur	354	6	$(354-354)*6/(1,205-354)$	0	1.1*
Rampur-Sangutar	643	6	$(643-354)*6/(1,205-354)$	2.0	2.0
Okhaldhunga-Nishangkhe	1,205	6	$(1,205-354)*6/(1,205-354)$	6.0	6.0

* Transformed by relating the lowest score (354) to the next lowest score (643)

$$\text{(for low values ranking best)} \quad d = \frac{\text{max} - x}{\text{max} - \text{min}} \text{ multiplied by score}$$

For each area of investigation, the road link with the lowest indicator value, variable 'd' results in '1' and is multiplied by the maximum available score as shown in Table 3.1.

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 Table 3.4 (cost estimate) have been used to show examples of the calculation.

Road Corridor	Cost per km (000 NRs.)	Max. Score	Calculation	Stand. score	Transformed score
Sirthauli-Patinyani	660	20	$(2,420-660)*20/(2,420-660)$	20	20
Dadi-Kapilakot	770	20	$(2,420-770)*20/(2,420-660)$	18.8	18.8
Bastipur-Nepalthok	2,420	20	$(2,420-2,420)*20/(2,420-660)$	0	6.0*

* Transformed relating to the nearest value i.e. $770/2420*18.8 = 6.0$

3.3 Scope and Limitation of DTMP/DTPP

The DTMP illustrates and explains the existing transport situation and sets out the five-year prospect of transport sector development of the district. DTPP on the other hand gives a very general overview of long-term perspective of transport sector for the period of twenty years. The DTMP is assumed to be completed with the next five years of implementation. The plan is mainly concerned with transport sector development within the district boundary but due consideration is given to the nearest road head and regional level synchronisation. Responsibility for the construction, rehabilitation and maintenance of district roads (as classified by the Nepal Roads Standard 2055 B.S.) lies with the DDC and the DTMP deals primarily with district level roads. The development of village roads and trails is beyond the scope of the DTMP.

Socio-economic data for the preparation of DTMP is collected both from secondary sources and through the RRA technique; the information content in the DTMP should be taken as indicative rather than definitive. Furthermore, approximate budgets for the implementation of the DTMP roads are prepared based on the past history of budget allocation and discussions

with district authorities. There will be some differences between the actual budget allocations for the road sector and the estimated budgets as indicated in the DTMP.

3.4 Road Referencing Systems

Roads are divided into road links stretching from node to node. Any road junction automatically becomes a node so that ultimately no road stretch is double defined and the whole network is completely determined by road links. On the basis of these road links road reference numbers are given following the 'Approach for Development of Agricultural and Rural Roads (DoLIDAR)'. Reference numbers for the strategic road network are taken from DoR's statistical data.

3.5 Defining Zone of Influence of the Roads

An accurate and consistent definition of the areas of influence of the proposed roads is a prerequisite for a reliable methodology; the same definition is used for all aspects of DTMP.

Each road link corridor is sub-divided into:

- The Inner Zone of Influence (IZI)
- The Outer Zone of Influence (OZI)

The **IZI** makes up the total area left and right of the road link within 2 hours walking time. The **OZI** extends to a perimeter of 6 walking hours. After taking into consideration the altitude changes, an average walking speed of 2.5 km per hour is assumed for the mid-hills. Empirical adjustments are to be carried out from case to case. Adjustments can be made for extraordinary topographic conditions such as barriers and in situations where field studies and local information are in conflict with the system used. For all mid-hill regions this translates into a horizontal distance of 5 km for the IZI and 15 km for the OZI. Whilst determining the IZI and OZI of each individual road link, consideration needs to be given to any large barriers. An example of this could be a long stretch of river that cannot be forded, so crossings need to be considered. In some cases, when a road link ends near the district boundary and also serves VDC's of the neighbouring district, these VDC's have to be added to the IZI and OZI of the particular road link.

By using the 'buffering' technique for each road link, with the above-defined IZI and OZI distances, the zones are demarcated. Where overlapping occurs, the media line (inter-section line between two circle segments) divides the neighbouring zones, resulting in unequivocal assignments of zones. In contrast to the network considerations, indicators can be applied only to discrete areas of influence i.e. for the sake of independent comparison of particular road links, no overlapping of zones of influence is allowed.

3.6 Aggregation of Score

As explained in Section 2, step 13 the scoring indicators are applied to each proposed road corridor. The total scores for each corridor are aggregated and the ranking of each proposed road is determined.

3.7 Indicators for District Transport Planning for New Construction Roads

Although indicators mainly reflect the existing situation along a proposed road corridor at the time of plan preparation, they also indicate the potentials and dynamics and can be used to make predictions of changes that may come about due to the proposed road link. All indicators of the scoring system except (V) "Development Potential" are based on facts of the existing situation. The facts are strictly separated from any potential considerations and are generally used to allocate scores under the different indicators.

Whilst the DTMP is based on facts the DTPP considers predictions and potentials. The DTPP is an instrument for long-term planning. It can be corrected in the course of regular revisions based on monitoring (see fig. 2.2) and evaluation of implementation progress.

Limitations in data quality may appear with regard to resolution, accuracy or reliability of the source e.g. outdated land use data of 1979 from Land Resource Mapping Project (LRMP). In such cases alternative data sources have to be consulted and data is checked and adjusted by comparison with other independent sources as available. If the accuracy of the data is suspect and no control data is available for comparison then the quantitative evaluation is abandoned and the suspect data may be used in a description way. Similarly, if an indicator becomes controversial in the context of a road impact, it is replaced by a simplified but stronger one, e.g. agricultural land per road kilometre (refer to 3.7.2).

3.7.1 Demography (Indicator I)

The population served per road corridor is aggregated for the IZI and OZI separately. The population in the immediate vicinity of a road will experience a higher degree of mobility, more economic opportunities and easier access to facilities and social interactions. Thus, a higher score is given for population in the IZI than for population in the OZI. The average population density of an individual VDC is applied over the total VDC area regardless of any population concentrations within the VDC area. A part of a VDC area falling in one of the zones of influence is segregated and multiplied by the total population density of the VDC so that it represents a fraction of the VDC population. In cases of high population concentrations within a VDC corrective measures have to be applied. This can be done by estimates made on the basis of settlement patterns given in the topographic map (Finnmap series from the 90s) or by primary data collected in the field.

The population figures are based on the 1991 census but projected to the year 2000 with the help of the annual district growth rate.

Population in the influence area of a single road link (example from Bastipur-Nepalthok road section in Sindhuli district)

VDC Served	Total VDC Pop. in 2000	Total Area [sqkm]	Area of IZI [sqkm]	% Area of IZI	Area of OZI [sqkm]	% Area of OZI	Pop. Density [in h/sqkm]	Pop. in IZI	Pop. in OZI	Total Pop. of IZI + OZI (2000)
A	B	C	D	E	F	G	H	I	J	K
				$=(D/C)*100$		$=(F/C)*100$	$=B/C$	$=H*E$	$=H*G$	$=I+J$
Bastipur	2,846	31.0	31.0	100.0			92	2,846		2,846
Kapilakot	7,504	116.2	8.8	7.8			65	561		561
Kusheshwor Dumja	4,637	29.9	18.2	60.9			155	2,823		2,823
Mahadevsthan	6,673	93.0	12.5	13.4			72	895		895
Netrakali	3,177	32.5	32.5	100.0			98	3,177		3,177
Shanteswori	2,628	30.4	14.0	45.9			86	1,205		1,205
Tamajor	2,445	21.4	21.4	100.0			114	2,445		2,445
Shanteswori	2,628	30.4			16.5	54.1	86		1,422	1,422
Total			138.4		16.5			13,953	1,422	15,375

Growth from 1991 up to 2000: 14.95%

Total population served by Bastipur-Nepalthok Road: 15,375

i) Total population in Inner Zone of Influence (IZI): 13,953

ii) Total population in Outer Zone of Influence (OZI): 1,422

TABLE 3.3

Scores of proposed roads based on demographic characteristics (example from Sindhuli district)

Road Corridor	Length (km)	Total Pop. IZI	Total Pop. OZI	IZI	OZI	Score (10)		Total Score (10)	Transformed score (10)
				(Pop/km)	(Pop/Km)	IZI (6)	OZI (4)		
Kushumtar-Bastipur	18.8	4,294	-	228	0	0.1	0.0	0.1	0.2
Bastipur-Nepalthok	30.0	13,953	1,422	465	47	0.6	0.3	0.9	1.4
Sindhulimadi-Bhimsthan	22.0	12,465	6,118	567	278	0.9	1.8	2.7	4.4
Bhimsthan-Bahuntipung	28.2	19,068	20,653	676	732	1.2	4.7	5.9	9.8
Sindhulimadi-Kapilakot	28.5	6,304	2,300	221	81	0.0	0.5	1.0	1.5
Kapilakot-Pipalmadi	30.0	16,472	18,595	549	620	0.8	4.0	4.8	8.0
Hatpate-Sirthauli	17.1	10,397	-	608	0	1.0	0.0	1.0	1.5
Sirthauli-Dudhauli	11.2	28,281	-	2,525	0	6.0	0.0	6.0	10.0

TABLE 3.4

Although demographic dynamics are considered one of the important parameters in transport planning, the DTMP does not incorporate them due to the lack of reliable data, particularly on migration trends.

3.7.2 Agricultural Resources/ Potential (Indicator II)

It is assumed that agricultural production systems undergo changes both in input use as well as output production, such as an increase in crop diversity or changes in yield volume. However accurate predictions of “with road” and “without road” agricultural performance are very difficult to prepare. Therefore, a relatively simple parameter i.e. agricultural land within the influence area of proposed road corridor is taken as an indicator of agricultural resource/potential. The total agricultural land is taken from the latest (1996) topographic map interpreted from aerial photographs of 1992 and field-verified in 1995.

The main land resource is separated into two categories i.e. within the IZI and within the OZI (not including the IZI). It is divided by the length of the particular road sector. This results in the agricultural land per road kilometre. The existing area of agricultural land is used for the quantitative evaluation of the agricultural resources (see Table 3.5).

Subsistence and surplus production is largely reflected in the agricultural potential. Predicted changes to the value of cash crops as well as the need for extra inputs for a higher yielding product have to be taken into consideration since they constitute agricultural inputs and outputs. It is considered that there is a high correlation between the production of cash crops and access to motorable roads. Studies show that food and cash crop production is highly significant except for maize, millet and barley; these can be regarded as subsistence products. Paddy is in general the most important crop. It can be expected that better road access and a linkage to the market/service centres will result in higher agricultural input and output rates. This is dependent on other related factors. These may include the efficiency of monetary flows related to earned cash and agricultural credit facilities as well as fair market competition and distribution of profits to the farmers. Labour-intensive construction methods of district roads can also provide significant short-term income in the form of wages to farmers. Classification of the agricultural potential is made under various headings such as agricultural intensification, horticultural intensification, livestock farming etc. The potential is categorised in terms of high, medium and low significance for entry into Table 3.12.

Scores of proposed roads based on agricultural resource base (example from Sindhuli district)

Road corridor	Length of Roads (Km)	Cultivated land area in IZI, ha/km	Cultivated land area in OZI, ha/km	Score (15)		Total Score (15)	Transformed Score (15)
				IZI (10)	OZI (5)		
Kushumtar-Bastipur	18.8	50	0	1.1	0.0	1.1	0.8
Bastipur-Nepalthok	30.0	92	10	2.1	0.5	2.6	1.8
Sindhulimadi-Bhimsthan	22.0	162	89	5.5	5.0	10.5	11.5
Bhimsthan-Bahuntipung	28.2	231	80	8.8	4.5	13.3	15.0
Sindhulimadi-Kapilakot	28.5	89	15	1.9	0.9	2.7	2.0
Kapilakot-Pipalmadi	32.2	130	14	3.9	0.8	4.7	4.4
Hatpate-Sirthauli	17.1	91	0	2.0	0.0	2.0	1.1
Sirthauli-Dudhauri	11.3	255	0	10.0	0.0	10.0	10.9

TABLE 3.5

3.7.3 Economic Structure and Central Services (Indicator III)

Primary data collected in the field is the main basis for determining the importance on relative importance of market/service centres 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 the PRRA approach. For evaluation purposes data on industry, business and government services is combined for the centre and its influence area. Assessment of economic facilities and services existing in the market/service centres and their catchment areas leads to the identification of the most important market/service centres. Concentration analysis of market facilities and government services is carried out. Weightage are assigned to different types of economic facilities and government services (Table 3.8) and they are then aggregated. Finally, the score for each proposed road is determined based on aggregate marks of each market/service centre which is in the zone of influence of the proposed road corridor.

For data collection on central services the sample questionnaire (See Vol. III Annexes) is sent to the district headquarters and the collected data is evaluated by the PSU. This approach provides an outline profile of the district with regard to central services and market facilities. A comparison of the results of the Main Trail Study of 1987 with the data collected for DTMP gives a good indication of the extent of development of market/service centres and main trails between 1987 and 2000. Based on the results of the analysis the central places can be categorised as main, medium or minor market centres.

Functional characteristics of existing market/service centres (example from Sindhuli district)

S. No.	Service/Infrastructure Category	Market Centre Code							
		Sindhumadi	Bhiman	Dakah	Dudhauri	Chakmake	Chhap	Khurkot	Hayutar
1.0	INDUSTRY								
1.1	Weaving Industry (no.)	1	0	0	0	0	0	0	0
1.2	Rice & flour Mills (no.)	6	16	21	15	7	10	7	3
1.3	Water Mill (no.)	1	0	0	0	1	10	0	11
1.4	Textile (no.)	0	0	0	0	0	0	0	0
1.5	Forest Based Industry (no.)	0	0	0	0	0	0	0	0
1.6	Handicraft (no.)	0	0	0	0	0	0	0	0
1.7	Mechanical/Fabrication (no.)	3	0	0	0	0	0	0	0
1.8	Agro-based (no.)	0	0	0	0	0	0	0	0
	Total	11	16	21	15	8	20	7	14

2.0	BUSINESS & COMMERCE								
2.1	Restaurants & Tea Stalls (no.)	45	25	35	14	16	4	15	7
2.2	Grocery Shops (no.)	18	5	7	7	10	5	3	1
2.3	Hardware Shop (no.)	3	0	0	5	0	0	0	0
2.4	Medical Shop (no.)	7	3	4	9	13	2	2	1
2.5	Clothes/Readymade Shop (no.)	26	9	9	6	6	8	4	1
2.6	Household Goods Shop (no.)	56	40	42	35	14	10	10	12
2.7	Hotels & Lodges (no.)	33	5	10	2	8	4	9	2
2.8	Other Shops (no.) (e.g. stationery, tailoring, etc.)	22	9	12	9	8	7	5	0
	Total	210	96	119	87	75	40	48	24
3.0	OFFICES								
3.1	Banks (no.)	2	1	2	1	0	1	0	2
3.2	Agriculture Service Office (no.)	1	1	2	1	0	1	2	2
3.3	Veterinary Office (no.)	1	1	1	1	1	1	1	2
3.4	Post Office (no.)	1	3	4	2	2	2	2	2
3.5	Telephone Office (no.)	1	0	2	1	0	1	0	2
3.6	Electricity Office (no.)	1	0	0	0	0	0	0	0
3.7	Co-operative Office (no.)	1	1	2	0	0	1	2	0
3.8	Women Development Office (no.)	1	1	0	0	0	0	0	0
3.9	NGOs (no.)	9	7	4	5	3	2	3	3
	Total	18	15	17	11	6	9	10	13
4.0	HEALTH								
4.1	Health Post (no.)	5	1	4	2	4	3	4	2
4.2	Hospital (no.)	1	0	0	0	0	0	0	0
5.0	EDUCATION	0	0	0	0	0	0	0	0
5.1	Primary School (no.)	14	8	9	9	16	8	6	5
5.2	High School (no.)	6	2	4	1	5	2	4	1
5.3	Campus (no.)	3	1	1	1	0	0	0	0
6.0	DRINKING WATER SUPPLY SCHEMES								
6.1	Gravity-Flow Scheme (no.)	2	3	0	0	0	1	0	0
6.2	Others (no.)	0	0	0	0	0	0	0	0
7.0	COMMUNICATION								
7.1	Post Office (no.)	6	1	4	1	2	2	2	2
7.2	Wireless (no.)	1	1	1	0	0	0	0	0
7.3	Telephone/fax (no.)	250	75	1	1	1	2	1	1
8.0	ELECTRICITY SUPPLY								
8.1	From Mini-hydro (yes/no)	No	No	No	No	No	No	No	No
8.2	From Micro-hydro (yes/no)	No	No	No	No	No	No	No	No
8.3	From Solar System (yes/no)	No	No	No	Yes	No	Yes	No	No
8.4	From Diesel Generator (yes/no)	No	No	No	No	No	No	No	No
8.5	From National Grid (yes/no)	Yes	Yes	No	No	No	No	No	No

Note: The parameters for determining the basic score can change from district to district in order to achieve a reasonable spread of scores.

TABLE 3.6

Weightage for economic and services facilities in the main market/service centres

Market/Institutions	Basic score	Parameters	Weightage
Industry	0	No listing	20
	1	<=4 industries	
	2	5-8 industries	
	3	9-12 industries	
	4	>12	
Business and commerce	0	No listing	20
	1	<= 47 business houses	
	2	48-94 business houses	
	3	95-141 business houses	
	4	>141 business houses	
Offices	0	No listing	10
	1	<=3 offices	
	2	4-6 offices	
	3	7-9 offices	
	4	>9 offices	
Total			50
Services	Basic score	Parameters	Weightage
Health	0	No listing	15
	1	1 health post	
	2	2 health posts	
	3	3 or more health posts	
	4	1 or more hospitals	
Education	0	No listing	10
	1	Only primary school	
	2	Primary schools + 1-2 high schools	
	3	Primary school plus 3 or more high schools	
	4	Campus of higher secondary school	
Drinking water supply	0	No Listing	10
	1	1-2 Gravity flow or other schemes	
	2	3-4 Gravity flow or other schemes	
	3	5-6 Gravity flow or other schemes	
	4	7 or more gravity flow or other schemes	
Communication	0	No listing	7.5
	1	Only Postal services	
	2	Postal services plus 1-2 rural telephone services (MARTs/VHF)	
	3	Postal services plus more than 3 rural telephone services (MARTs/VHF)	
	4	Digital telephone services	
Electricity	0	No listing	7.5
	1	Solar/diesel generator	
	2	Micro hydro power	
	3	Mini hydro power	
	4	National grid	
Total			50

TABLE 3.7

Central analysis of main market/service centres and their area of influence (example from Sindhuli district)

Name	Markets/Institutions (50% Weightage)				Services (50% Weightage)						
	Industry	Business	Offices	Total	Health	Education	Water	Communication	Electricity	Total	Grand Total
Sindhulimadi	15.0	20.0	10.0	45.0	15.0	10.0	2.5	7.5	7.5	42.5	87.5
Bhiman	20.0	15.0	10.0	45.0	3.8	10.0	5.0	7.5	7.5	33.8	78.8
Dhakaha	20.0	15.0	10.0	45.0	11.3	10.0	0.0	3.8	0.0	25.1	70.1
Dudhauri	20.0	10.0	10.0	40.0	7.5	10.0	0.0	3.8	1.9	23.2	63.2
Chakmake	10.0	10.0	5.0	25.0	11.3	7.5	0.0	3.8	0.0	22.6	47.6
Chhap	20.0	5.0	7.5	32.5	11.3	5.0	2.5	3.8	1.9	24.5	57.0
Kurkot	10.0	10.0	10.0	30.0	11.3	7.5	0.0	3.8	0.0	22.6	52.6
Hayutar	20.0	5.0	10.0	35.0	7.5	5.0	0.0	3.8	0.0	16.3	51.3

TABLE 3.8

The weightages shown in Table 3.7 are applied to the results of the survey shown in Table 3.6. This provides the basis for the compilation of Table 3.8, which shows the total results for each centre including its influence area. The influence area can also include sub centres of medium and small size.

In general, the classification of minor, medium and major market/service centres is in accordance with the score in Table 3.8 using the following parameters:

- Over 75: Major
- 50 to 75: Medium
- 30 to 50: Minor

It should be noted that in practice some modifications have to be made to the above parameters depending on the number of market/service centres in a particular district.

Aggregate scores of proposed roads based on services provided by existing market/service centres (example from Sindhuli district)

Road Corridor	Market/ service Centres	Market/ service centres' weightage	Total weightage	Length of the Road (km.)	Weightage per Km length	Total Score (10)	Transformed Score (10)
Kusumtar~Bastipur	Sindulimadi	87.5	138.8	18.8	7.4	10.0	10.0
	Hayutar	51.3					
Bastipur~Nepalthok	Haitar	51.3	51.3	30.0	1.7	0.0	0.1
Sindulimadi~Bhimsthan	Sindulimadi	87.5	87.5	22.0	4.0	4.0	4.0
Bhimsthan~Bahuntulpung	Chakmake	47.6	47.6	28.2	1.7	0.0	0.1
Sindulimadi~Kapilkot	Sindulimadi	87.5	144.5	28.5	5.1	5.9	5.9
	Kapilakot (Chhap)	57.0					
Kapilkot~Pipalmadi	Kapilakot	57.0	57.0	32.2	1.8	0.1	0.1
Hatpate~Sirthauli	Dakaha	70.1	70.1	17.1	4.1	4.2	4.2
Sirthauli~Dudhauri	Dudhauri	63.2	63.2	11.2	5.6	6.9	6.9

Note: The total score is determined by using the methodology described in Section 3.2.

TABLE 3.9

With regards to evaluation, the sector occupational structure is an exception from the other sectors: The data is evaluated only for the centre but not its influence area because

diversification to sectors other than agriculture occurs only in the centre itself. In addition, only the category that appears as the major one is selected and the basic score is assigned (See Table 3.8). Table 3.9 represents the final evaluation of all road corridors under study.

3.7.4 Trade Flow/ Predicted Changes (Indicator IV)

The trade flow data is collected from key-informants at different market/service centres along the proposed road corridor through the use of PRRA and through discussions with relevant agencies. The results for Okhaldhunga are show in Figure 3.3

EXISTING TRADE FLOW (EXAMPLE FORM OKHALDHUNGA DISTRICT)

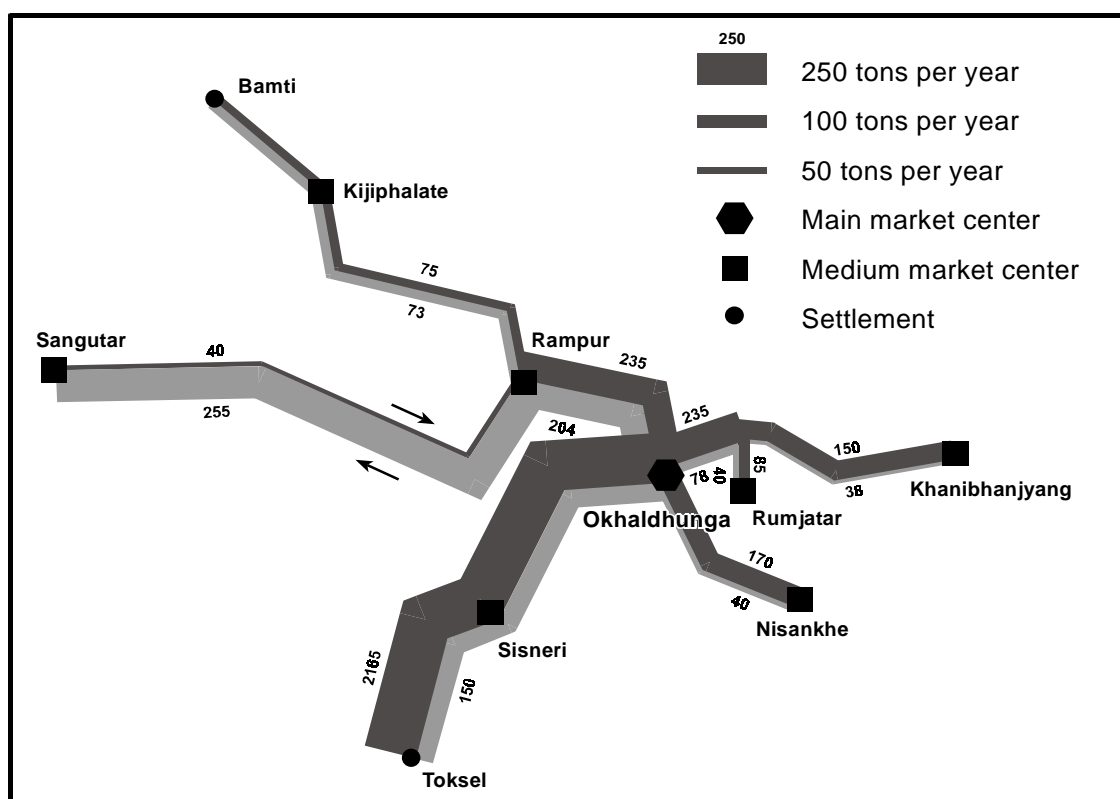


FIGURE 3.3

Table 3.10 illustrates the evaluation system, which is based on the trade volumes and varying portorage and other relevant rates. These factors are combined to make up the weighted average transport costs per road corridor. The road links with the highest transportation costs are assumed to receive the highest benefits from the presence of a road. As a result they get highest scores. The average rate of transport cost by transport mode is obtained from the key informants survey along the trail of proposed road corridor and from other concerned agencies. Finally weightage average transport cost is calculated as follows;

$$\text{Average transport cost (Rs/ton/Km)} = \frac{\sum_{i=1}^n v_i r_i}{LV}$$

Where;

- v_i = Volume of commodities transported along the proposed road by i^{th} mode of transport
- r_i = Transport rate (Rs/ton) to carry commodities through the proposed road by i^{th} mode of transport
- L = Length of the proposed road/trail
- V = Total Volume of commodities transported along the proposed road (ton/year)

Average transport cost of the proposed road (example of Hatpate – Sirthauli road from Sindhuli District)

Mode of Transport (a)	Average transport rate (Rs./ton) (r)	Average number of trips per Day (c)	Load per trip (ton.) (d)	No. of days in a year trail is open to traffic (e)	Total Commodities (ton./year) (V)=c*d*e	Total Transport Cost (Rs) (g)=v*r
1. Horse	2,000	1	0.1	300	30	60,000
2. Tractor	2,000	1	2.5	270	675	1,350,000
3. Porter	4,500	10	0.05	365	182.5	821,250
4. Truck	1,800	0.5	5.0	270	675	1,215,000
Total					1,563	3,446,250

TABLE 3.10

$$\begin{aligned}
 \text{Approximate length of Road/ trail} &= 17.1 \text{ Km} \\
 \text{Weightage average transport cost (Rs/ton/Km)} &= \frac{\sum_{i=1}^4 v_i r_i}{LV} \\
 &= 3,446,250 / (1,563 \times 17.1) \\
 &= 129
 \end{aligned}$$

Scores of proposed roads based on volume of trade flow (example from Sindhuli district)

Road Corridor	Length of road (Km)	Trade volume by transport mode (Ton/Year)					Total Trade volume (Ton/Year)	Weighted Average Transport cost Rs/ton/Km	Total Transport cost (Rs/Km/Year)	Total Score (15)	Transformed Score (15)
		Porter	Mule/horse	Truck	Tractor	Tyre gada					
Kusumtar~Bastipur	18.8	750					750	186	139,500	9.2	9.2
Bastipur~Nepalthok	30.0	183					183	167	30,561	0.0	1.4
Sindulimadi~Bhimsthan	22.0	504			720		1,224	115	140,760	9.3	9.3
Bhimsthan~Bahuntulpung	28.2	504			360		864	133	114,912	7.1	7.1
Sindulimadi~Kapilkot	28.5	540			900		1,440	145	208,800	15.0	15.0
Kapilkot~Pipalmadi	32.2	170			360		530	128	67,840	3.1	3.1
Hatpate~Sirthauli	17.1	183	30	675	675		1,563	129	201,627	14.4	14.4
Sirthauli~Dudhauri	11.3	360			105	10	475	153	72,675	3.5	3.5

TABLE 3.11

3.7.5 Development Potential (Indicator V)

The development potential is largely influenced by other resources and activities beyond the agricultural sector, e.g. food processing, storage, timber forest and non-timber forest products, mining, hydropower development sites, settlement construction, industry and tourism.

Table 3.12 gives a summary of the trends as previously discussed and considers other potential resources for development. According to the significance given, a total weight per road link is determined and is entered into Table 3.13 for comparison of the road corridors. All trends and potentials in Table 3.12 constitute a need for roads, i.e. if the potential has a higher significance, more traffic is expected to be created leading to a higher need for a road. A high significance rating is assigned a weight of 50%, medium significance 30% and low significance 20%. (See Table 3.12)

Development potential per road corridor (IZI and OZI) (example from Sindhulimadi-Bhimasthan road in Sindhuli district)

POTENTIAL/ TREND	SIGNIFICANCE		
	<i>High</i>	<i>Medium</i>	<i>Low</i>
Growth of market centres		√	
Growth of market/service centres			√
Agricultural intensification		√	
Horticultural intensification	√		
Livestock farming		√	
Fisheries			√
High valued cash crops		√	
Agro-based industries			√
Timber products		-	-
Non-timber forest products	√		
Cottage or large scale industry			√
Mining	-	-	-
Hydropower and water mills			√
Construction projects	-	-	-
Business and commerce	√		
Trade flow	√		√
Tourism			√
Total	4	4	7
Weight	Total x 0.5	Total x 0.3	Total x 0.2
Score	2.0	1.2	1.4

TABLE 3.12

Scoring of development potentials within the areas of influence (IZI and OZI) (example from Sindhuli district)

Road Corridor	Weight of Potentials	Total score (5)
Kushumtar-Bastipur	4.8	5.0
Bastipur-Nepalthok	4.4	3.9
Sindhulimadi-Bhimasthan	4.6	4.4
Bhimasthan-Bahuntipung	4.7	4.7
Sindhulimadi-Kapilakot	3.0	2.3
Kapilakot-Pipalmadi	4.4	3.9
Hatpate-Sirthauli	4.2	3.3
Sirthauli-Dudhauri	4.3	3.6

TABLE 3.13

3.7.6 District Priority (Indicator VI)

A combined DRCC/DDC meeting is convened by the chairperson and attended by the DRCC members and a representative of the PSU. All proposed road links are discussed with regard to social issues, impacts on historic sites, remote areas and areas for special consideration.

Through consensus the priority list is finalised and is entered into the table of the final scoring as an indicator (See Table 3.14).

Scores of proposed roads based on district priorities (example from Sindhuli district)

Road Corridors	Total marks given	Total score (5)
Kushumtar-Bastipur	4.0	5.0
Bastipur-Nepalthok	4.0	5.0
Sindhulimadi-Bhimsthan	3.0	2.5
Bhimsthan-Bahuntipung	3.0	2.5
Sindhulimadi-Kapilakot	3.0	2.5
Kapilakot-Pipalmadi	3.5	3.8
Hatpate-Sirthauli	2.5	1.3
Sirthauli-Dudhali	2.0	1.0

TABLE 3.14

3.7.7 Tentative Construction Costs of Proposed Roads (Indicator VII)

The tentative construction costs are compiled on the basis of data collected during the walk over survey to assess the technical and environmental issues of the proposed road corridor. Unit costs are calculated using district approved unit rates for labour, material and by using performance values of similar road construction works, which were completed in the past. It is assumed that the accuracy of the road alignment, after the walk over survey, is identified within ± 50 meters (plan section).

For planning and ranking, the construction cost estimate assumes a fair weather road construction standard. Works such as graveling and bridge/culvert construction are not included in the tentative estimate. It is further assumed that mainly local material is used and that the construction works are carried out on a labour based construction approach.

The tentative construction costs include the quantities and rates for:

- Unskilled labour, semi-skilled labour, skilled labour
- Local materials such as stones, sand, aggregates, gravel etc.
- Non-local materials such as cement, reinforcement bars, HDPE pipes, geotextile, gabion wire boxes, etc.
- Vehicle and fuel and hire rates for truck/ tractor

The initial cost estimate is compiled from components as listed under the headings Table 3.15. The overall construction cost is influenced by other factors assessed during the walk over survey and information compiled from topographical maps. These are all considered in the final calculation process.

Components of Initial Cost Estimate

Headings:	Factors influencing the workload and therefore the overall construction costs.
Survey and design:	Works carried out by the district technical unit or a local consultant.
Site clearance:	Land use pattern.
Earthworks in excavation and backfill:	Slope degree and type of soil/rock for excavation and backfill on material
Transportation of excavated materials:	Distance between quarry and dumping sites
Retaining and support structures:	Slope degree and length of wall
Stone pitching:	Length of Gradients between 10% and 12%
Stone masonry side drain:	Length of side drain
Bioengineering works:	Plantation area
Transportation of local materials:	Mode of transportation: porter, mule or tractor

TABLE 3.15

An example of the calculation of construction costs is given in Table 3.16.

Summary and Breakdown of Project Cost (example from Sindhuli District)

Road: Dakaha-Sirthauli

Length: 11.000

A. DEPARTMENTAL COST		NRs.
A.1	Survey and Design Cost	176,000
A. Total		176,000

B. COST OF THE WORK BY USERS'/ LOCAL LABOUR GROUP		NRs.
B.1	Site Clearance	212,500
B.2	Earthwork in Excavation and Backfill	691,000
B.3	Transportation of Excavated Materials with a Lead above 50m	0
B.4	Stone Pitching in Gradients above 10%	0
B.5	Bio-Engineering Works	55,000
B.6	Cost of Transportation of Local Materials	215,147
B.7	Provision of Lay-Byes (3m*20m) @ 3 nos per Km	264,000
sub-total, I		1,437,647
Provision for tools, plants & equipment @ 3%, (a)= I*0.03		43,129
sub-total, II = I+(a)		1,480,776
Provision for operational expenses @ 5%, (b)= II*0.05		74,039
sub-total, III = II+(b)		1,554,815
Provision for contingencies @ 5%, (c)= III*0.05		77,741
B. Total = III+(c)		1,632,556

C. COST OF THE WORK BY LOCAL CONTRACTOR		NRs.
C.1	Construction of Retaining/Support Structures	3,915,000
C.2	Water Management	216,000
sub-total, IV		4,131,000
Provision for tools, plants & equipment @ 3%, (d)=IV*0.03		123,930
sub-total, V = VI+(d)		4,254,930
Provision for contractor's overhead @ 15%, (e)= V*0.15		638,240
sub-total, VI = V+(e)		4,893,170
Provision for VAT @ 10%, (f)= VI*0.10		489,317
sub-total, VII = VI+(f)		5,382,486
Provision for contingencies @ 5%, (g)= VII*0.05		269,124
C. Total = VII+(g)		5,651,611

GRAND-TOTAL, A+B+C		7,460,167
Say, NRs.		7,500,000
NRs. PER KILOMETRE		678,197
Say, NRs.		680,000

Note: - Backup sheets for this table e.g. labour rates and material costs can be found in Vol. III.

TABLE 3.16

A sample summary of construction costs is shown in Table 3.17. The rating is dependent on costs per road kilometre.

After a road has been selected for construction, a detailed survey and design is carried out and a detailed cost assessed/compiled. After this it is subdivided into yearly construction costs. The yearly fund requirements are based on the staged construction approach. In the first year, a track of up to 3.00 meters in width is excavated. In years two and three, the track is widened to 5.00 meters, basic water management and retaining walls are constructed and steep sections are

stone paved. The road is now motorable to fair weather standard. Maintenance operations now have to start and need to be included in the financial planning.

Summary of initial costs and engineering rating of proposed roads (example from Sindhuli district)

Road Corridors	Type of Alignment	Length km.	Total Cost NRs.	Cost per km NRs.	Engineering Rating	
					Total score (20)	Transformed Score (20)
Sindhulimadi-Bhimsthan						
-Sindhulimadi-Wollo Rampur*		6.0	1,600,000	260,000	-	-
-Wollo Rampur-Bhimsthan		18.0	21,100,000	1,180,000	14.1	14.1
Bhimsthan-Bahunthlung	River	26.0	45,300,000	1,750,000	7.6	7.6
Hatpate-Sirthauli						
-Ratanpur-Dakaha*		7.0	3,200,000	460,000	-	-
-Dakaha-Sirthauli	River	11.0	7,500,000	680,000	19.8	19.8
Sirthauli-Dudhauli						
-Sirthauli-Patiyani	River	6.0	3,950,000	660,000	20.0	20.0
-Patiyani-Dudhauli *		5.0	500,000	300,000	-	-
Kusumtar-Bastipur		18.0	38,100,000	2,120,000	3.4	3.4
Sindhulimadi-Kapilakot						
-Sindhulimadi-Dadi *		10.5	3,500,000	340,000	-	-
-Dadi-Kapilakot	River	17.5	13,400,000	770,000	18.8	18.8
Kapilakot-Pipalmadi	River	30.0	66,150,000	2,210,000	2.4	2.4
Bastipur-Nepalthok		30.0	72,500,000	2,420,000	0.0	2.2

* Existing roads for rehabilitation

TABLE 3.17

In this first DTMP it is assumed that most districts construct all road to fair weather standard. However high traffic volumes may justify construction of some roads to a higher standard. In such cases appropriate adjustments must be made in the costing and cost comparison methodology.

3.7.8 Environmental Issues/ Predicted Impacts (Indicator VIII)

The process of DTMP preparation includes for the carrying out an IEE during the early stages. Integration of this step 6 early in the process leads to the identification of environmentally friendly road corridors for further survey and analysis. This promotes 'prevention' rather than 'cure' of environmental problems in a broader development perspective. IEE is a tool generally used for ascertaining each project's viability from an environmental point of view. It also integrates social and environmental concerns into development projects. Such considerations at an early stage in planning can easily avoid many adverse environmental and social impacts, which would otherwise be difficult and complicated to deal with at later stages.

A walkover survey is carried out along each road link focusing on the environmental conditions and a profile description of the proposed road link is made. Factors such as rivers/lakes, geology, forest and wildlife, socio-economic/cultural aspects, natural hazards and sites of aesthetic and scientific value are considered. In total, 37 environmental aspects are examined and categorised into a) minimum negative effect or non-affected b) significant negative impact and c) serious negative impact.

- **Minimum Negative Effect or No Effect:** The environment is considered to be "minimally effected" by road construction and traffic if 27 or more aspects are found to be in this category.
- **Significant negative impact:** A road link is labelled with "significant negative impacts" if 10 or more aspects are in this category and need mitigating measures.

- **Serious negative impact:** One single serious negative impact on any aspect would result in the final judgement of a road link being non-feasible unless measures could be taken to avoid or reduce the impact to a maximum of “significant”.

The environmental rating for each proposed link is illustrated (for Sindhuli District) in Table 3.18

Scoring is carried out simply by adding up the number of aspects which are in the minimum/non effected column for each proposed road.

Summary of environmental rating of proposed roads (example from Sindhuli district)

Road Corridor	Type of Alignment	Length (km)	Environmental Rating				
			Aspects Not Effected	Sign.	Serious	Total score (10)	Transformed Score (10)
Sindhulimadi-Bhimsthan							
-Sindhulimadi-Wollo Rampur*		6.0	-	-	-	-	-
-Wollo Rampur-Bhimsthan		18.0	34	3	0	10.0	10.0
Bhimsthan-Bahunthiplung	River	26.0	34	3	0	10.0	10.0
Hatpate-Sirthauli							
-Ratanpur-Dakaha*		7.0	-	-	-	-	-
-Dakaha-Sirthauli	River	11.0	34	3	0	10.0	10.0
Sirthauli-Dudhauri							
-Sirthauli-Patiyani	River	6.0	34	3	0	10.0	10.0
-Patiyani-Dudhauri *		5.0	-	-	-	-	-
Kusumtar-Bastipur		18.0	30	7	0	0.0	4.7
Sindhulimadi-Kapilakot							
-Sindhulimadi-Dadi *		10.5	-	-	-	-	-
-Dadi-Kapilakot	River	17.5	32	5	0	5.0	5.0
Kapilakot-Pipalmadi	River	30.0	33	4	0	7.5	7.5
Bastipur-Nepalthok		30.0	30	7	0	0.0	4.7

* Existing roads for rehabilitation

TABLE 3.18

3.7.9 Social Issues (Indicator IX)

Due to difficulties with social data collection the social indicators are confined to poverty data. The population along the proposed road corridors is divided into three social strata, i.e. the ultra-poor, the poor and those living above the existence level. Ultra-poor households are defined as those having less than three months food sufficiency; poor households are defined as households having less than 9 months food sufficiency. Those having more than nine months food sufficiency are considered to be living above the existence level. These indicators are used to evaluate the poor population per road kilometre in both the IZI and the OZI. Table 3.19 is a sample taken from the Sindhuli district and gives information of the ratios of the ultra-poor and poor population along the proposed road corridors. The higher the numbers of people living in poverty, the higher the scores.

Population effected by poverty in the influence area of the proposed road (example from Sindhuli district)

Road Corridor	Length (km)	Tot. Pop. of IZI+OZI	Tot. Ultra Poor Pop. of IZI+OZI	Tot. Poor Pop. of IZI+OZI	Pop. per km road length		Score			Transformed Score (10)
					UP	P	UP (6)	P (4)	Total (10)	
Kushumtar-Bastipur	18.8	4,294	145	834	8	44	0.1	0.2	0.3	0.3
Bastipur-Nepalthok	30.0	15,375	657	3,995	22	133	0.4	1.3	1.7	1.4
Sindhulimadi-Bhimasthan	22.0	18,583	1,660	3,008	75	137	1.8	1.3	3.1	2.9
Bhimasthan-Bahuntipung	28.2	39,721	1,937	6,539	69	232	1.6	2.7	4.3	4.2
Sindhulimadi-Kapilakot	28.5	8,604	839	1,791	29	63	0.6	0.3	0.8	0.6
Kapilakot-Pipalmadi	32.2	35,067	2,088	4,839	65	150	1.5	1.5	3.1	2.8
Hatpate-Sirthauli	17.1	10,397	825	1,422	48	83	1.1	0.6	1.6	1.4
Sirthauli-Dudhauli	11.2	28,281	2,588	3,615	231	323	6.0	4.0	10.0	10.0

Note: UP= Ultra-Poor
P = Poor

TABLE 3.19

3.8 Aggregation of Scores from all Nine Scoring Indicators

Table 3.20 shows the total scoring of all indicators per road corridor (Refer to Table 3.1). The rank of each corridor is given according to the total score.

Prioritisation of individual road corridors (example from Sindhuli district)

Road Corridor	Parameters Used for the Prioritisation of Road Corridors and Their Corresponding Scores										
	Demography (10)	Agriculture (15)	Market/service centres (10)	Trade flow (15)	Dev. Pot. (5)	District Priority (5)	Const. Cost (20)	Enviro nm. (10)	Social Aspects (10)	Total Score (100)	Rank
A	B	C	D	E	F	G	H	I	J	K	L
										=B+C+D +E+F+G +H+I+J	
Kushumtar-Bastipur	0.2	0.8	10.0	9.2	5.0	5.0	3.4	4.7	0.3	38.6	VI
Bastipur-Nepalthok	1.4	2.5	0.2	1.4	3.9	5.0	2.2	4.7	1.7	23.0	VIII
Sindhulimadi-Bhimasthan	4.4	15.8	4.4	9.3	4.4	2.5	14.1	10.0	3.1	67.9	II
Bhimasthan-Bahuntipung	9.8	20.6	0.2	7.1	4.7	2.5	7.6	10.0	4.3	66.8	III
Sindhulimadi-Kapilakot	1.5	2.8	6.0	15.0	2.4	2.5	18.8	5.0	0.8	54.7	V
Kapilakot-Pipalmadi	8.0	6.0	0.4	3.1	3.9	3.8	2.4	7.5	3.1	38.3	VII
Hatpate-Sirthauli	1.5	1.5	4.4	14.4	3.3	1.3	19.8	10.0	1.6	57.8	IV
Sirthauli-Dudhauli	10.0	15.0	6.7	3.5	3.6	1.0	20.0	10.0	10.0	79.8	I

TABLE 3.20

3.9 Parameters used for Prioritisation of Existing Roads for Rehabilitation

It is difficult to find a simple and pragmatic method of combining the prioritisation of both new roads and roads for rehabilitation. The economic return from opening up fair weather roads is usually greater than that gained from rehabilitating existing fair weather roads. For major roads it is possible to use cost benefit analysis to get a combined ranking. However, for lightly trafficked and poorly maintained district roads, where economic indicators are not the most important a separate ranking is made for each category i.e. proposed new roads and roads recommended for rehabilitation.

It should be noted that roads which are in need of major reconstruction or major re-alignment are treated as proposed new roads rather than roads in need of rehabilitation. Value judgements may be required from qualified technical people in order to identify such roads.

The parameters used for prioritisation of roads for rehabilitation are given in Table 3.2. They are generally in accordance with those recommended in the DoLIDAR's "Approach for the Development of Rural and Agricultural Roads".

The district authorities (DDC/DRCC) with guidance and advice from the PSU, decide on the division of available resources between new roads and rehabilitation. In general, district roads are in a poor state due to the lack of adequate maintenance and many roads need rehabilitation to bring them to a maintainable state. In districts with significant district road networks it is preferable to allocate a majority share of district resources to rehabilitation rather than to new road construction. However due consideration has to be given to the need to provide road access to isolated areas.

3.9.1 Population within the Area of Influence of the Road (Indicator I – 10% weight)

The absolute number of people living within the combined IZI and OZI of the road is used as the indicator for this indicator. The population is taken from the 1991 census and projected to the current date. The highest population achieves the highest score available and the standard distribution formula as described in Section 3.2 is used to determine the scores for the other roads.

Prioritization of roads for rehabilitation based on population served (example from Sindhupalchok district)

Road name (section for rehabilitation)	Length km	Total Population within IZI	Total Population within OZI	Population per km of road length	Score (10)	Transformed score (10)
Shramthali-Thokarpa-Chehere (Shramthali-Attarpur)	7.2	10,545	0	265	0.2	0.2
Shramthali-Thokarpa-Chehere (Wafal-Chhere)	19.5	10,545	0	265	0.2	0.2
Sikre-Thulodhading (Piukharka-Barkhang)	7.4	2,905	0	208	0.0	0.1
Talamarang-Bhotechour-Sankhu (Uppalogaun-Dhusenichaur)	2.0	20,671	0	746	1.8	1.8
Talamarang-Bhotechour-Sankhu (Dhusenichaur-Bhotechaur)	19.0	20,671	0	20,671	1.8	1.8
Melchaur-Bhaise	11.0	20,653	1,486	2,013	5.9	5.9
Chautara-Syaule-Okhreni (Chautara-Syaule)	6.0	6,722	0	560	1.1	1.2
Barhabise-Budhepa	6.5	25,586	2,252	3,010	10.0	10.0
Chautara-Sipaghat	28.0	18,191	0	650	1.4	1.4

TABLE 3.21

3.9.2 Agricultural Exports (Indicator II – 10% weight)

According to this indicator, scores are awarded on the basis of the volume of agricultural exports which are transported along the road or along the road corridor if the road is closed or in bad condition. In order to make a comparison between different roads the volumes of the various agricultural exports including livestock are converted to cash values at local prices. RRA and information gained from discussions with key people are used to gather the necessary data. As standard in this methodology, the highest available score i.e. 10, is awarded to the road(s) with the highest cash value and the scores are awarded according to the scoring system described in Section 3.2.

Prioritisation of roads for rehabilitation based on value of agricultural export (example from Sindhupalchok district)

Name of Road Section	Length Km	Volume of agriculture product exported (ton/year)	Total export value based on farm gate price (Rs 000)	Value of agriculture export /km of road length	Score	Transformed score
Shramthali-Thokarpa-Chehere (Shramthali-Attarpur)	7.2	640	5,550	139	0.4	0.4
Shramthali-Thokarpa-Chehere (Wafal-Chhere)	19.5	640	640	16	0.4	0.4
Sikre-Thulodhading (Piukharka-Barkhang)	7.4	220	2,130	152	0.4	0.4
Talamarang-Bhotechour-Sankhu (Uppalogaun-Dhusenichaur)	2.0	1,075	13,850	500	1.6	1.6
Talamarang-Bhotechour-Sankhu (Dhusenichaur-Bhotechaur)	19.0	1,075	13,850	500	1.6	1.6
Melchaur-Bhaise	11.0	28	284	26	0.0	0.1
Chautara-Syaule-Okhreni (Chautara-Syaule)	6.0	327	5,410	451	1.4	1.4
Barhabise-Budhepa	6.5	215	4,710	554	1.7	1.7
Chautara-Sipaghat	28.0	5,260	85,790	3,064	10.0	10.0

TABLE 3.22

3.9.3 Market/Service Centres (Indicator III - weight 10%)

The importance of existing road links is indicated by the importance of the market/service centers which are connected by the road or which exist within its zone of influence. A relatively low but significant weight is given to this indicator. The methodology employed to gather document and analyse the data is the same as that used for new road comparisons. (See Section 3.7.3)

Prioritisation of roads for rehabilitation based on market/service centre analysis (example from Sindhupalchok district)

Name of Road section	Length Km	Market/ service centres	Weightage value	Total Weightage value	Per km Weightage value	Score (10)	Transfo rmed score (10)
Shramthali-Thokarpa-Chehere (Shramthali-Attarpur)	7.2	Lamosanghu	82.0	82.0	2.1	0.0	0.5
Shramthali-Thokarpa-Chehere (Wafal-Chhere)	19.5	Lamosanghu	82.0	82.0	2.1	0.0	0.5
Sikre-Thulodhading (Piukharka-Barkhang)	7.4	Lamosanghu	82.0	82.0	5.9	2.8	2.8
Talamarang-Bhotechour-Sankhu (Uppalogaun-Dhusenichaur)	2.0	Melamchi	84.0	84.0	3.0	0.7	0.7
Talamarang-Bhotechour-Sankhu (Dhusenichaur-Bhotechaur)	19.0	Melamchi	84.0	84.0	3.0	0.7	0.7
Melchaur-Bhaise	11.0	Chautara Lamosanghu	88.0 82.0	88.0 82.0	15.5	10.0	10.0
Chautara-Syaule-Okhreni (Chautara-Syaule)	6.0	Chautara	88.0	88.0	7.3	3.9	3.9
Barhabise-Budhepa	6.5	Barhabise	88.0	88.0	10.4	6.2	6.2
Chautara-Sipaghat	28.0	Chautara Sipaghat	88.0 88.0	88.0 88.0	5.1	2.2	2.2

TABLE 3.23

3.9.4 Traffic Movements (Indicator IV – weight 25%)

The volume and type of traffic movements is the major indicator for assessing the relative importance of existing road links. However, since most of the roads being considered for rehabilitation are fair weather earthen roads that are in a poor state or closed to traffic, the conduct of a traffic census is usually not effective in providing the data required. Instead, the data on traffic movement is gathered from RRA and discussions with key individuals within the road corridor and at district and village level. Scores are awarded on the basis of the estimated traffic volumes on each of the roads being considered for rehabilitation. In accordance with traffic coefficients given in DoLIDAR's "Approach for the Development of Rural and Agricultural Roads", large trucks (more than 10 tones carrying capacity) and buses (Over 40 passengers) are given a weight of 4.0, small trucks (up to 10 tones carrying capacity) and buses (up to 40 passengers) are given 3.0 and tractors (4W towed trailers) are given a weight of 3.0, cars and pick-ups, light-vans, jeeps are given a weight of 1.0. Total scores are assigned according to the system described in Section 3.2

3.9.5 Rehabilitation Costs (Indicator V – weight 25%)

The second most important indicator, after traffic movements is the cost of rehabilitation per km on each road under consideration. Cost estimation is based on the data collected during the walk over survey for Initial Environmental Examination. Unit costs are calculated on the basis of district approved rate for labour and materials. A maximum score of 30 is assigned for this parameter and the scores are distributed proportionately with the road(s) with the lowest rehabilitation cost km getting the highest score.

**Prioritisation of roads for rehabilitation based on rehabilitation cost per km of road length
(example from Sindhupalchok district)**

Name of Road Section	Length km.	Total rehabilitation Cost (NRs.000)	Cost per km (NRs.000)	Engineering Rating	
				Scores (25)	Transformed score (25)
Shramthali-Thokarpa-Chehere (Shramthali-Attarpur)	7.2	4,100	570	19.3	19.3
Shramthali-Thokarpa-Chehere (Wafal-Chhere)	19.5	10,350	530	20.2	20.2
Sikre-Thulodhading (Piukharka-Barkhang)	7.4	5,550	750	15.2	15.2
Talamarang-Bhotechour-Sankhu (Uppalogaun-Dhusenichaur)	2.0	2,850	1,420	0.0	7.2
Talamarang-Bhotechour-Sankhu (Dhusenichaur-Bhotechaur)	19.0	5,950	320	25.0	25.0
Melchaur-Bhaise	11.0	5,200	470	21.6	21.6
Chautara-Syaule-Okhreni (Chautara-Syaule)	6.0	24,00	400	23.2	23.2
Barhabise-Budhepa	6.5	5,400	830	13.4	13.4
Chautara-Sipaghat	28.0	25,800	930	11.1	11.1

TABLE 3.24

3.9.6 Maintenance Costs (Indicator VI – weight 20%)

Future Maintenance costs on each road after rehabilitation can vary according to the:

- Geology of the road corridor
- Relief of the terrain in the road corridor
- Road alignment
- Water management system
- Pavement type
- Maintenance of existing structures
- Existing settlements/buildings at the edge of the road

The district technical unit is responsible for the accurate estimation of the detailed maintenance operations for inclusion in the YPO. However, for prioritisation purposes the scoring is done in a more subjective manner (if the detailed maintenance estimates are not available).

On the basis of a walkover survey by the district staff, assisted by the PSU, and taking the above criteria into account each proposed road for rehabilitation is given a maintenance cost score (See Table 3.25). The scores given to each road are compared (See Table 3.26) and the transformed score is compiled with a maximum of 20 points given to the lowest maintenance cost road (per km).

Maintenance Costs on each Proposed Road for Rehabilitation (example from Sindhupalchok district)

Name of Road Section Shramthali-Thokarpa-Chehere (Wafhal - Chehere)	Minor Difficulty (Weight 3)	Significant Difficulty (Weight 2)	Major Difficulty (Weight 1)
Geology of the road corridor			√
Relief of the terrain in the road corridor	√		
Road alignment			√
Water management system		√	
Pavement type			√
Maintenance of existing structures		√	
Existing settlements/ buildings at the edge of the road		√	
Total	1	3	3
Weighted Total	3	6	3
Total Maintenance Cost Score	12		

TABLE 3.25

Comparison of Maintenance Cost Scores (example from Sindhupalchok district)

Name of the Road Section	Maintenance Costs Score	Transformed Score (Max 20)
Shramthali-Thokarpa-Chehere (Wafal-Chhere)	12	8
Sikre-Thulodhading (Piukharka-Barkhang)	13	12
Talarang-Bhotechour-Sankhu (Dhusenichaur-Bhotechaur)	13	12
Melchaur-Bhaise	11	4
Chautara-Syaule-Okhreni (Chautara-Syaule)	15	20
Barhabise-Budhepa	10	3.5
Chautara-Sipaghat	12	8

Note 1: Transformed score according to the methodology in Section 3.2.

Note 2: The above table has an incomplete list of roads for rehabilitation.

Note 3: Lowest maintenance cost achieves the highest score.

TABLE 3.26

Prioritisation of existing roads for rehabilitation (example from Sindhupalchok district)

Name of Road Section	Length (km)	Pop. (10)	Agricultural export (10)	Market/ Service Centres (10)	Vehicular movement (25)	Rehabilitation cost (25)	Maintenance cost (20)	Total Score (100)	Rank
Shramthali-Thokarpa-Chehere (Wafal-Chhere)	19.5	0.19	0.37	0.5	Data not yet available	24.2	8.0	33.26	VII
Sikre-Thulodhading (Piukharka-Barkhang)	7.4	0.14	0.42	2.8		18.3	12.0	33.66	VI
Talamarang-Bhotechour-Sankhu (Dhusenichaur-Bhotechaur)	19.0	1.76	1.56	0.7		30.0	12.0	46.02	III
Melchaur-Bhaise	11.0	5.88	0.10	10.0		29.9	4.0	49.88	I
Chautara-Syaule-Okhreni (Chautara-Syaule)	6.0	1.15	1.40	3.9		27.8	15.0	49.25	II
Barhabise-Budhepa	6.5	10.0	1.74	6.2		16.1	3.5	37.54	IV
Chautara-Sipaghat	28.0	1.44	10.0	2.2		13.4	8.0	35.04	V

Note: The above list of roads is not exhaustive and the table is for illustrative purposes only.

TABLE 3.27**3.10 Funding Sources for the DTMP Implementation**

It is necessary to gather details of all resources which are expected to be available to the districts over the plan period. This information is necessary for determining the extent of the works which can be included in DTMP. The division of resources between construction, rehabilitation and maintenance can vary from district to district and depends on the nature and size of the district road network. No new construction or rehabilitation should be completed without adequate provision for maintenance after completion. The expected funding sources are generally similar in all districts but the extent of the actual funds can vary from district to district particularly with regard to donor funding. Details of the anticipated resources available for DTMP implementation is collected by the PSU from the districts, HMG and from donors. Ongoing rural road/rural access programmes are consulted with regard to future plans for expansion or curtailment. The most likely sources of funding are listed as follows:

- HMG
- National Road Fund
- DDC resources
- VDC resources
- Donors

3.10.1 HMG

Funding from HMG is channelled to the DDCs and VDCs through various conducts and under various headings. The DDC's block grant (currently NRs 2,000,000 per annum) and the VDCs block grant (currently NRs 500,000 per annum) are allocated by HMG. The block grants are used largely at the discretion of the DDCs and VDCs and reflect the district and village priorities.

HMG also provides funding to the districts through the inline ministries. This funding is usually earmarked for specific projects which are agreed between the districts and the in-line ministries.

One of the most important sources of funding for transport infrastructure improvements is HMG funding which is sent to the districts through DoLIDAR. This funding is meant to be spent on the development of agricultural roads in the districts.

Closely associated with block grant, the Constituency Development Fund of NRs 1,000,000 per constituency is under the control of each member of parliament.

3.10.2 National Road Fund

Although the National Road Fund has not yet been established, it is expected that parliament will pass the necessary legislation during the current or the next session of parliament. The National Road Fund will mainly gather its resources through fuel levies, road tolls and vehicle taxes. Up to 25% of the resources of the National Road Fund is earmarked for the maintenance of district roads on a counterpart funding basis. It is expected that the NRF contributions will be channelled to the districts through DoLIDAR. The amount of funds available to each district will depend on each districts length of district road and on its ability to raise matching funds.

3.10.3 DDC Internal Sources of Funding

DDCs have varying capacity to raise funds internally. The main sources of internal funding are often related to the districts natural resources, the size and affluence of its population and to its level of commercial, industrial and agricultural development. The main sources of internal funding are land taxes, royalties on natural building material (sand, gravel, stone), road tolls, levies on utility charges etc.

3.10.4 Donor Funding

Donor funding is an important element of development funding in the districts. Some districts are more successful than others in attracting donor projects to their districts. In recent years donors have become very interested in funding rural road/access programmes all over Nepal and it is expected that this will be growing trend. The possession of a rational and clearly defined district transport development plan will be an important tool to attract donors and to help ensure that donor projects are designed and implemented in accordance with district priorities.

3.10.5 Local Contributions

Some districts or projects encourage local contributions, in the form of cash or labour for the construction of district or village road. For construction projects this is not usually a very significant source of funding but it could be an important resource for the maintenance of roads by the local communities in partnership with the DDCs and VDCs.

3.11 Matching of Resources on High Ranked DTMP Roads

In each participating district, the PSU carries out a thorough investigation and analysis of the availability of resources for road construction, rehabilitation and maintenance over the DTMP period. The investigation includes meetings with key individuals at district level, with relevant HMG ministries and departments at central level, and with donors. Past funding trends are analysed and projected forward where necessary. Thus the total estimate of transport resources over the five-year period is determined for each district.

At this stage the estimated resources are matched with the highest ranked DTMP roads. Construction costs are already estimated (See section 3.7.7 and 3.9.5) so the number of highest ranked road links to be completed over the DTMP period can be determined. The proposed DTMP Implementation plan is prepared by the PSU for approval by the district authorities.

The proposed implementation plan outlines the development of DTMP roads and allocates the tentative budget to different components of the individual roads. In most of the districts a number of construction, rehabilitation and maintenance activities have already been initiated. These activities are usually incorporated in the framework of the DTMP and will be continued over the coming years. For illustrative purposes, the physical and financial planning over the

DTMP planning period in Sindhuli district is shown in Table 3.28. It reflects allocated/committed funds for defined activities and eventual annual surpluses/deficits. Whilst eventual surpluses can be used for additional activities, deficits will have to be deducted from already allocated DTMP road budgets. These additions/deductions have to be sanctioned during the annual meeting of the District Council.

3.12 Preparation of DTPP

The DTPP has a perspective of 20 years. The DTPP is revised every five years when a new DTMP is being prepared according to the rolling plan system (See Section 2).

As outlined in step 17 in Section 2, relevant sections of the draft DTMP along with a map which shows the proposed DTMP roads and existing village, district and strategic network roads is prepared by the PSU and distributed to each VDC. Guidelines are also prepared and distributed by the PSU to assist the VDCs in understanding the maps and the sections of draft DTMP which have been distributed to them. The guidelines also give details of the procedures for suggesting modifications to the Draft DTMP and for formulating proposals for DTPP (as outlined below).

Through discussions with the DDC and Ilaka members an appropriate date(s) is chosen for the holding of Ilaka level meetings where the representatives of the VDCs (normally VDC chairpersons, VDC secretaries and woman representatives) discuss the draft DTMP and present their proposals for DTPP.

Depending on individual district circumstances the Ilaka level meetings can be for single Ilakas or groups of two or three Ilakas. In the interests of better coordination it is better to hold all the Ilaka level meetings at various venues in a central place e.g. district H.Q, at the same time. Each Ilaka level meeting (or group of Ilaka meeting) is facilitated and guided by PSU and district Staff. Proposals from the VDCs are discussed and incorporated with proposals from other VDCs. The facilitators endeavour to find a consensus on the ranking of road priorities for DTPP and on proposals for modifications to the draft DTMP. The proposals from the Ilaka meetings are compiled and synchronised by the PSU and district officers and form the basis for the review of the draft DTPP and for the modification of the draft DTMP by the DRCC. Based on the recommendations of the DRCC the final draft of both the DTMP and DTPP is prepared by the PSU for approval by the district authorities (See Section 2, step 21). It is crucial that adequate logistic arrangements are made by the PSU and the district beforehand.

This methodology recommends that an orientations session is arranged by the PSU and district staff for each Ilaka on the day before the proposals are received and discussed. During the orientation session the guidelines and maps are fully explained to the participants and they are assisted with the preparation and finalisation of their proposals. By the end of the orientation session the participants will understand the objectives and process of DTMP/DTPP preparation and will be clearly aware of their role within the process.

Physical and Financial Plan for DTMP Roads (example from Sindhuli district)

Road corridors	Length of Road (Km)	DTMP Implementation Year				
		2058/59	2059/60	2060/61	2061/62	2062/63
<i>Likely available budget</i>		19,316	25,669	26,883	28,276	29,873
Sirthauli-Dudhauri	6.0	1,079	1,775	2,378		
Hatpate-Sirthauli	11.0				2,866	3,852
Sindhulimadi-Bhimasthan	18.0		6,598	7,390	7,390	8,277
Sindhulimadi-Kapilakot	17.5	2,875	3,306	3,802	4,483	
Kushumtar-Bastipur	18.8	6,450	4,749	7,978	8,935	10,008
Sub-total		10,404	16,428	21,548	23,675	22,137
Rehabilitation						
Bhiman-Harsahi-Tandi	20.0	1,200	1,500			
Sindhulimadi-Pallorampur	6.0	1,602				
Ratanpur-Dakaha	7.0		5,034			
Patiyani-Dudhauri	5.0	1,680				
Sindhulimadi-Dadi	10.5	3,675				
Sub-total		8,157	6,534			
Periodic Maintenance		1,350	3,509	5,990	6,131	9,575
Routine Maintenance		324	887	1,453	1,896	2,353
Total		20,235	27,358	28,991	31,701	34,064
Deficit/Surplus		-919	-1,688	-2,108	-3,425	-4,192

TABLE 3.28**3.13 District Transport Plan Implementation**

A well prepared and rational district transport plan is a prerequisite for the effective and efficient use of available resources for the development of each district's transport network.

However, the possession of a plan is only the beginning and each district must prepare a methodology for the effective implementation of its plan. The implementation methodology must cover organisational and institutional issues as well as budgetary and cash flow issues. When donors contribute to the development and implementation of the district transport network due account will have to be taken of programme conditionality. Each district will have to decide on whether to use a mechanised or a labour based approach. Rolling plans e.g. two or three-year plans may be necessary and a yearly plan of operation is a very useful implementation and monitoring tool. Most districts will need ongoing support from DoLIDAR with the implementation of their district transport plans. Such support will include financial support, technical manpower and guidance on technical standards, norms and specifications.