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Transport Infrastructure Map 1: 125,000; District Transport Plan, Sindhupalchowk District

## **FOREWORD**

## **APPROVAL SHEETS**

**DISTRICT ROADS COORDINATION COMMITTEE**

1	Mr. Suresh Nepal	:	DDC Chairperson	:	Chairperson
2	Mr. Dambar Bahadur Aryal	:	DDC Vice Chairperson	:	Member
				:	
3	Mr. Som Bahadur Sapkota	:	DDC Member	:	Member
4	Mr. Meghnath Poudel	:	DDC Member	:	Member
5	Mr. Nima Gaygen	:	DDC Member	:	Member
6	Mr. Gopal Shrestha	:	DDC Member	:	Member
7	Ms. Radha Thami	:	DDC Member	:	Member
8	Mr. Kamal Shrestha	:	DDC Member	:	Member
9	Mr. Mitra Lal Chaulagain	:	DDC Member	:	Member
10		:	Party Representative (CPM-UML)	:	Member
11		:	Party Representative (NC)	:	Member
12		:	Party Representative (RPP)	:	Member
13		:	Representative from Divisional Road Office, Charikot	:	Member
		:	Representative from District Agricultural Development Office	:	Member
14	Mr. Jeevan Guragain	:	DDC, Engineer	:	Member
15	Mr. Krishna Prasad Devkota	:	Local Development Officer	:	Member
				:	Secretary

**DISTRICT TECHNICAL TEAM**

1	Mr. Jeevan Guragain	:	Engineer / DoLIDAR
2	Mr. Dinesh Singh Maharjan	:	Engineer /DRSP
3	Mr. Shyam Kumar Chaudhari	:	Overseer /DRSP
4	Mr. Vidhyadhar Chaudhari	:	Overseer /DRSP

## **ABBREVIATIONS AND ACRONYMS**

APP	Agricultural Perspective Plan
CBS	Central Bureau of Statistics
DDC	District Development Committee
DoLIDAR	Department of Local Infrastructure Development and Agricultural Roads
DoR	Department of Roads
DRCC	District Road Coordination Committee
DRF	District Road Fund
DRSP	District Roads Support Programme
DTMP	District Transport Master Plan
DTPP	District Transport Perspective Plan
FfW	Food for Work
FY	Fiscal Year
HMG	His Majesty's Government
IEE	Initial Environmental Examination
IZI	Inner Zone of Influence
km <sup>2</sup>	Square Kilometre
LDO	Local Development Officer
LGP	Local Governance Programme
LRCC	Local Road Coordination Committee
MDWP	Melamchi Drinking Water Project
MoLD	Ministry of Local Development
msl	Metres Above Sea Level
NGO	Non Government Organisation
NPC	National Planning Commission
NRs	Nepalese Rupees
OZI	Outer Zone of Influence
PSU	Programme Support Unit
RCIW	Rural Community Infrastructure Works
SDC	Swiss Agency for Development and Cooperation
UG	Users' Group
VDC	Village Development Committee
YPO	Yearly Plan of Operation

# 1. INTRODUCTION

## 1.1 Background

Sindhupalchowk district is located in the middle hills in the Central Development Region of Nepal. It borders with Tibet (China) and Rasuwa district in the north, Dolakha district and Tibet (China) in the east, Nuwakot and Rasuwa districts in the west and Kabhrepalanchowk and Kathmandu districts in the south. Chautara, the district headquarter has access to Kodari Highway by a single-lane feeder road from Chautara to Dolalghat.

Sindhupalchowk district is predominantly rural with an average population density of about 103 persons per square kilometre in 1991. The district belongs to one of the least populated districts in the country. Chautara, the district headquarter, is the largest urban centre in the district. The annual population growth rate is 1.16%. The general information of the district is presented in Table 1.1

**General Information of the District**

Population 2000	289,849
Population growth % Per annum	1.16%
Regional /Urban centre	Kathmandu
Length of existing roads (km.)	235
Area of district (sq. km.)	2489.9
Area of Agricultural land (sq. km)	723.2
Area of forest/scrub land (sq. km)	1104.7
Area of grassland (sq. km)	125.4
Others (sq. km)	536.6
Road density (pop / km of road )	1,233.4
Road density (Cultivated land / km of road )	3.08

*Source: Digitised data, DRSP, May 2000, Periodic Plan, DDC Sindhupalchowk, 2000 and Record on Nepalese Development: Nepal District Profile, 1999*

**TABLE 1.1**

The total area of the district is 2489.9 sq. km<sup>1</sup>. The distribution of the land resource base indicates that about 44.4 percent of total area is under forest/scrub and about 29.0 percent of total area is under agriculture.

Based on annual population growth of 1.16 percent, it has been estimated that the district had population of 289,849 during 2000.

During the Programme Orientation and Vision Sharing Workshop in December 1999, Sindhupalchowk, together with 4 other districts of the Central Region and one district from the Eastern Region, qualified for support through the District Roads Support Programme (DRSP). This support takes the form of capacity building as well as planning, implementation and maintenance of district roads. The programme is co-financed by the Swiss Agency for Development and Cooperation (SDC), His Majesty's Government of Nepal (HMG) and the participating districts.

The DDC of Sindhupalchowk has realised that the provision of enhanced access through district roads to areas with resource potentials in a planned manner will have a positive impact on the social and economic development of the district. As a result the DDC has given high priority to the

<sup>1</sup> This finding is based on the data digitised with the use of AutoCAD software and compiled with the use of Arc View GIS software version 3.2 at DRSP office.

preparation of the District Transport Master Plan/District Transport Perspective Plan (DTMP/DTPP) within the framework of DRSP.

District Roads Support Programme (DRSP) has given a high priority for the maintenance of existing roads in addition to the construction of new roads. Additionally, the programme has been providing technical support to Rural Community Infrastructure Works (RCIW) in implementing road construction through Food for Work Programme (FfW).

## **1.2 Objectives and Rationale of the DTMP/DTPP**

One of the major factors for slow development of social and economic structures in Sindhupalchowk district is due to lack of adequate transport infrastructure. The objective of the District Transport Master Plan (DTMP) and District Transport Perspective Plan (DTPP) is to facilitate access to areas with resource potentials and to guide the spatial arrangement of rural settlements, market and service centres of the district. This is done through developing a sustainable road network that reduces the aggregate transportation cost and minimises the environmental impact.

The DTMP will provide the fundamental base for planning and implementation of the maintenance of existing roads and construction of new district roads in Sindhupalchowk district over a period of five years starting from the fiscal year of 2001/2002 to 2005/2006. The plan recommends roads that have a high priority for the rehabilitation/maintenance and new construction in the district. This includes roads which link the existing district roads or with strategic road network in the country. The DTPP, on the other hand, reflects the perspective plan of the district over the next 20 years. In addition, these plans will provide HMG and donors a rational basis to decide on future investments towards the improvement of the district transport situation.

It is therefore expected that implementation of the DTMP / DTPP will minimise the current ad-hoc practices of investing on roads based on short-term considerations. This is especially crucial due to high demand for rural roads and the shortage of funds for their construction.

## **1.3 Methodology**

The different phases and procedures of the methodology for preparing the DTMP and the DTPP are elaborated in Volume I "Methodology". The methodology is an integral part of the Sindhupalchowk DTMP/DTPP. It describes in detail the individual steps of the planning cycle and provides the basis for prioritisation and decision-making process. The methodology and scoring system were approved by the District Road Coordination Committee (DRCC) of Sindhupalchowk district during the district consultation workshop in September 2000.

The separate parameters have been used for the prioritisation of new roads and roads for rehabilitation that is explained in detail in the methodology (refer to section 3.7 and 3.9, Volume I). This methodology has been used for the prioritisation of new roads and existing roads for rehabilitation proposed by the district to be considered under the five years DTMP.

The DTMP has been prepared in a participatory manner. It started with the formation of the DRCC and has continued with the involvement of the most important stakeholders of the district throughout the entire development process.

The chronology of events in the course of DTMP / DTPP development can be summarised as follows:

### Chronology of Events in DTMP/DTPP Development

Date	Achievement	Participants/ Ownership	Remarks
November 1999	Formation of District Road Coordination Committee (DRCC)	DDC Sindhupalchowk DRSP/PSU	Workshop in Sindhupalchowk
December 1999	Hire of District Technical Team (1 engineer and 2 overseers)	DDC Sindhupalchowk	
December 1999	Sindhupalchowk District agreed to participate in the District Road Support Programme	DDC Chairman DDC LDO DoLIDAR SDC DRSP/PSU	DRSP Programme Orientation and Vision Sharing Workshop in Kathmandu
April 2000	Status and analysis of the strategic road network and the district road network	District Technical Team DRSP/PSU	Collection of primary and secondary data in the district and with concerned HMG departments
May 2000	Preliminary selection of road corridors for DTMP considerations.	DRCC DRSP/PSU	Workshop in Sindhupalchowk
August 2000 - May 2001	Collection of data and analysis of individual road corridors. <ul style="list-style-type: none"> <li>• Demography</li> <li>• Agriculture area</li> <li>• Agriculture export</li> <li>• Economic structure and central services</li> <li>• Trade/Traffic flow</li> <li>• District Priority</li> <li>• Construction/Rehabilitation/Maintenance Costs</li> <li>• Environment</li> <li>• Social</li> </ul>	DDC/DRCC District Technical Team DRSP/PSU	Data collection in Sindhupalchowk and Kathmandu
October 2000	Development and approval of scoring system. Finalisation of criteria for prioritisation.	DRCC, DRSP/PSU	Workshop in Sindhupalchowk
November – December 2000	Formation and training of Local Road Coordination Committees (LRCC)	DRSP/PSU	Meetings and workshops in the district
December 2000	Regional synchronization of DTMP roads in consultation with the neighbouring district and HMG stakeholders.	Members of: NPC, DoR, DoLIDAR, SDC, DRSP/PSU	One day workshop in Kathmandu
January - March 2001	Coordination with District line agencies for social intervention	DRSP/PSU	Meetings and workshops in the district
February 2001	Selection of the DTMP roads for Training Road (Rehabilitation/Maintenance)	DDC/DRSP	Meeting at Sindhupalchowk

<b>Date</b>	<b>Achievement</b>	<b>Participants/ Ownership</b>	<b>Remarks</b>
May 2001	Presentation of DTMP findings and guidelines for DTPP data collection to the VDCs	All VDC Chairman of the district, Ilaka Members, DDC/DRCC, DRSP/PSU	Workshop in Sindhupalchowk
June 2001	Collection of proposal from VDCs for DTPP in the VDCs.	VDC Chairman, VDC Vice Chairman, Ilaka Members	Consultation meetings in the VDCs
July 2001	Analysis of expected funds available for road construction and maintenance works in the next five years.	PSU	Consultation meetings with HMG Departments and potential donor agencies
April 2002	Prioritization of the DTMP roads.	DDC/DRCC	Workshop in Kathmandu
<b>May 2002</b>	Approval of Draft DTMP by DDC	DDC/DRCC	DRCC Meeting in Sindhupalchowk
<b>June 2002</b>	Approval of Draft DTMP and DTPP by the District Council.	DDC, DRSP/PSU	District Council Meeting in Sindhupalchowk
<b>July 2002</b>	Final editing of approved DTMP/DTPP		DRSP/PSU
	Endorsement by MoLD Endorsement by NPC		

**TABLE 1.2**

## 2. DISTRICT INVENTORY / DISTRICT PROFILE ANALYSIS

The purpose of this chapter is to give a general overview of the Sindhupalchowk District. Emphasis has been given to issues related to transport planning. The information provided here underlines and illustrates the findings and conclusions of the analysis regarding prioritisation and decision-making.

### 2.1 Physical and Meteorological Characteristics

#### 2.1.1 Location

The district lies between the northern latitudes of 27°27' to 28°13' and the eastern longitudes of 85°27' to 86°06'. Chautara, the district headquarters is approximately 86 km north-east of Kathmandu. The district borders with Tibet (China), Dolakha, Kathmandu, Kabhreplanchowk, Rasuwa and Nuwakot districts.

#### 2.1.2 Geo-Physical Aspects

The district lies mainly in the hills and mountain between Mahabharata Lek and lesser leading to agro-climatic variations in different pockets of the district. The topographical setting of the district is made up of undulated terrain, tars, lowland areas and riverbanks. About 16 percent of the area of the district lies in the high Himalaya, while the remaining 51 and 33 percent are located in high mountain and mid mountain region respectively.

#### 2.1.3 Political Division of the District

The district is divided into 3 electoral constituencies; 13 Ilakas and 79 Village Development Committees (VDCs).

#### 2.1.4 Climate

Due to different geo-physical conditions the climate varies from sub-tropical to temperate. The climate of the district changes according to the altitude. It is hot along the river basin. The climate is sub-tropical in the middle mountain and cool temperate in the high mountain region. The average maximum and minimum temperature of the district is 25°C and 5°C respectively. The average annual rainfall in the district is 2,348 mm.

### 2.2 Economic Activities

Agriculture is the major source of income and employment in the district. The agriculture alone directly or indirectly provides employment for over about 92 percent of the economically active population. However, according to 1991 population census, the total district populations are categorized as follow (Table 2.1) based on their major occupation:

**Occupational Structure of the District Population**

SN	Occupational category	Percentage of Population
1	Agriculture (including livestock and fishing)	60.73
2	Trade and business	1.02
3	Technical service an and other services	2.11
4	Industry and other alternate enterprises	0.20
5	Others	0.94

Source: District Periodic Plan, Sindhupalchok, 2000

**TABLE 2.1**

The economy of the district is supported by formal sector employment like teaching, civil service, and by informal sector employment like agricultural labor, porter and remittance from seasonal migration to cities like Kathmandu, Terai and Indian cities for non-farm labor. Haat bazaar, a traditional periodic market system, contributes to the local economy providing opportunities for selling farm outputs and buying different consumer goods imported from Kathmandu and Terai.

There are more than a dozen of Haat bazaars within the district that take place during different days of the week.

## 2.3 Demographic and Social Characteristics

### 2.3.1 Demography

According to the latest 1991 population census, the total population of the district was 261,125 with 131,523 male and 129,602 female populations. There are about 51,291 households and settlements are randomly scattered over the district. The average household size is 5.09, and the average population density is 103 inhabitants per sq.km. The overall demographic features of the district are presented in Table 2.2.

**Demographic Characteristic of the District**

Characteristics	1981 Census	1991 Census
Total population:	232,326	261,125
Male	122,663	131,523
Female	109,663	129,602
Economically active population:	129,379	146,256
Male	79,912	74,627
Female	49,467	71,629
Total households	42,713	51,291
Average household size	5.43	5.09
Population density per sq.km	92	103

Source: Record on Nepalese Development: Nepal District Profile, 1999

**TABLE 2.2**

A review of population in the district suggests that the population density is considerably lower in the northern area of the district in the high hills and mountain region in comparison to the middle hills.

### 2.3.2 Social Aspects

The comparatively low economic activity in the district is reflected by a high percentage of the population living below the subsistence level. About 45 percent of the population are living below the poverty line, while 52 percent of the population have food sufficiency for less than 9 months (poor households) and 5 percent have food sufficiency for even less than 3 months (ultra-poor households). According to DDC periodic plan (2001/02-2006/07), it is estimated that more than 57 percent of the total population are unable to produce sufficient food from their own-farm resources, and large number of population have to purchase food from their off-farm income mainly accrued from off-farm labouring and remittances. Furthermore, about 5 percent of the total population are under serious malnutrition. For their survival female members of poor and ultra-poor population seek employment as daily wageworkers and as porters within the district, male members have to search for income outside the district in Kathmandu or India.

### 2.3.3 Health Aspects

The district hospital is located at the district headquarter, and there are 11 health posts, 65 sub-health posts, and 2 primary health centres in the district. Additionally, there are 5 Ayurvedic dispensaries located in different VDCs of the district. Although the numbers of health offices are set up in different location of the district, people are not getting satisfactory health services due to lack of staff and equipment in the health offices. Looking at the present health situation and available facilities of the district, the health services available are far below the peoples' demand and requirement. As a result people have to travel to Dhulikhel, Banepa or Kathmandu for treatment even for the minor cases.

### 2.3.4 Religious Activities

Hinduism and Buddhism are the major religions of the people. There are many religious places scattered in the district. Amongst them, Gaurati Bhimeshowar, Sunkoshi Mahadev, Palchowk Bhagawati, Tauthali Maisthan, Tatopani, Fatkeswor Mahadev, Dhupu, Paanchpokhari, Naulengeshwaor, Bhirabkunda etc are mostly known places of destination for Hindu Pilgrims. Thousands of pilgrims from different parts of the district and adjoining districts visit there every year. Those religious spots have enhanced the potential of developing tourism industry in the district.

## 2.4 Service Centres and Services

### 2.4.1 Overview

The main service centres are the places, which provide most of the economic facilities and public and private services to the population of the district. They have been identified based on the criteria outlined in Chapter 3.7.3 of Methodology (Volume I).

The construction of Arniko highway and Lamosanghu-Jiri road has promoted the growth of market centres along the road corridors. Bahrabise, Lamosanghu, Chautara, Melamchi, and Tatopani are the major service/market centre of the district (refer to map 2).

Chautara is the district headquarters and the main market centre of the district. Chautara service/market centre grew up rapidly after the construction of the feeder road from Chautara to Dolalghat that provided the direct access to the district headquarter with the Arniko highway. The estimated population of Chautara was about 2,685 during 2000. Most of the government offices, hospital, schools and campus are located here. The majority of the population from the district visit Chautara for official as well as for personnel reasons. Commodities are exported out and imported to and from different VDCs of the district to Chautara. Other service/market centres are scattered over the district. The population of different service/market centres are shown in Table 2.3 (refer to map 2).

**Main Service/Market Centres**

Service/Market Centres	Household & Population (2000)	
	Household	Population
Bahrabise	350	1,700
Chautara	321	2,685
Melamchi	250	1,250
Jalbire	200	1,000
Sipaghat	200	1,200
Lamosanghu	300	1,500

Source: Annex 3.3.1

**TABLE 2.3**

### 2.4.2 Description of Main Service Centres

There are more than 20 market/service centres scattered through out the district. Out of these, Chautara, Barhabise, Lamosanghu, Melamchi, Jalbire and Sipaghat are considered as main and medium market/service centres of the district. The distribution pattern of settlements and service centres indicate that most of the plain areas and riverbanks have a dense settlement and population distribution due to favorable land use pattern, agricultural production, infrastructure development and other socio-economic factors. The other small market/service centres of the district are Bhotechaur, Talarang, Tipani, Nawalpur, Balefi, Sikre, Sukute, Syaule, Tatopani etc. The description of the major market/service centres are discussed hereunder.

## **Chautara**

Chautara is the district headquarters and is located at the end point of Dolalghat-Chautara feeder road. It has a direct link to the Arniko highway which is connected to the capital city. This is one of the main service centre of the district and most of the government and non-government offices of the district are located here. In addition to service centre, Chautara serves as one of the key market centre of the district. The market has facilities like school, bank, police post, health centre, government offices, telecommunication service, grocery stores etc. At present the total estimated population of Chautara bazaar is 2,685.

## **Bahrabise**

The Bahrabise bazaar is located on the Arniko highway and serves as a gateway to Tibet from Kathmandu. This is the major market centre for Chinese goods other than daily consumable goods and agricultural products. The Chinese products being cheaper are finding wider market even in the capital and other parts of the country which increases the trade and traffic flow along the Arniko highway. Bahrabise bazaar in addition to a market centre, also serves as a major service centre to the north-east region of the district and some adjoining VDCs of Dolakha district. The total estimated population of Bahrabise is 1,700 and it has a service of electricity supply, health post, bank, public telephone, post office etc. Bahrabise is also the main access for the Haandi Khola II and Haandi Khola IV hydropower project site.

## **Melamchi**

Melamchi is the market/service centre located at the converging point of Indrawati and Melamchi rivers. It serves as a regional market/ service centre to the south-west region of the district. An access road to the proposed Melamchi drinking water supply project passes through this market centre. Since there is regular bus from Kathmandu, people travelling to the north-west, particularly Helambu region and Bhotang area, travel via Melamchi bazaar. The total estimated population of Melamchi market/service centre is 1,250. This market has services like schools, health post, telephone, Ayurvedic centre and electricity.

## **Lamosanghu**

The market/service centre at Lamosanghu is located on the bank of Sunkoshi river. It serves as one of the main important market and service centres in the district. This is also the converging point of Arniko highway and Lamosanghu-Jiri strategic road which helped in the growth of Lamosanghu market. The market provides services of commercial bank, telephone, post office, police post, electricity grocery stores etc. At present, the population residing at this market/service centre is around 1,500. This is also well known as Chinese goods markets where large variety of Chinese products is available. Sunkoshi hydropower project site is located at Pangretar VDC south of Lamosanghu on the bank of Sunkoshi river.

## **Jalbire**

Jalbire market/service centre is situated on the bank of Balephi river. This is a traditional market and main trading centre to the people from the northern part of the district. The existing Balephi-Jalbire road and proposed Jalbire-Tembathan towards the northern part of the district passes through this market/service centre. The market is well known in the district for the export of agricultural and forest products particularly potatoes and the Himalayan herbs. It provides services like bank, agriculture service centre, Veterinary service centre, health post, telephone etc. The total estimated population of Jalbire market/service centre is about 1,000.

## **Sipaghat**

Sipaghat is a traditional market/service centre for southern part of Sindhupalchowk district, and is located on the bank of Indrawati river on the side of Kabhrepalanchowk district. The access road to Melamchi Drinking water project site also passes through this market centre. The existing Sipaghat-Nawalpur road also starts from Sipaghat market/service centre. This centre is primarily known as collection centre of different agricultural products like cereals, vegetables, fruits and dairy milk produced in the nearby VDCs. It provides services of hotels, NGOs, post office, general grocery shops etc. The total estimated population of Sipaghat market/service centre is about 1,200.

## 2.5 Existing Transport and Communication Situation (Roads, Trails, Bridges)

### 2.5.1 Accessibility

Sindhupalchowk district as a whole is moderate in terms of transportation and communication infrastructure among the other hilly districts of Nepal (refer to map 3). The existing road networks within the district is summarised in Table 2.4. At present, the district has 67 km black-topped, 67 km gravelled and 101 km earthen road. Although, there are many roads under construction at village and district level, only few of them are motorable (Table 2.4). Out of the total 13 Ilakas in the district, 4 Ilakas are still far from the reach of motorable road. Arniko highway that passes through the district is the only major transportation link of Sindhupalchowk district. In addition, 27 km initial section of Lamoshanghu-Jiri strategic road also runs through Sindhupalchowk district. Similarly, Lamidanda-Melamchi and Dolalghat-Chautara are other important feeder roads of the district. Chautara-Melamchi (31.5 km) and Chehere-Thokarpa-Shramthali (13.1km) road corridors are under construction from RCIW expanded programme. Similarly, an access road from Melamchi to Tipeni is basically used and maintained by Indrawati -III Hydropower Project.

The existing road networks within the district are in varying condition that is further deteriorating in the absence of due maintenance and rehabilitation works. Interventions are limited to emergency repairs and many of these roads become inaccessible even during the dry season. The financial and technical constraint of the DDC is the main reason for not being able to maintain the existing road networks. However, the DDC has given high priority for the maintenance and rehabilitation works for the existing roads to bring the road to maintainable condition during the period of DTMP preparation.

#### Inventory of Existing Transport Linkages

Transport Linkages	Reference Number	Total Length (km)	Remarks
Arniko Highway	H3	55.0	Highway
Panchkhal-Helambu	F30	29.0	Feeder Road
Dolalghat -Chautara	F31	25.1	Feeder Road
Lamosanghu-Tamakoshi-Ramechhap	F32	28.0	Feeder Road
Jalkini-Bhanjyang	23B002R	3.0	Partly Motorable
Melchaur-Bhainse	23A004R	11.0	Partly Motorable
Jyadikharka-Satdobato-Ikhu	23B006R	8.0	Partly Motorable
Ranitar-Sangachowk	23B008R	4.0	Not Motorable
Dandagaun-Sano Neupanegaun	23B009R	2.5	Not Motorable
Dothedanda-Gaitar-Sipaghat	23B010R	20.0	Partly Motorable
Chautara-Sipaghat	23A011R	28.0	Partly Motorable
Nawalpur-Sipaghat	23A013R	13.8	Partly Motorable
Chautara-Melamchi	23A014R	21.0	Partly Motorable
Phatkeshowr-Chhap Bhanjyang	23A020R	7.0	Partly Motorable
Bhotechaur-Sindhukhola	23B021R	4.8	Partly Motorable
Dhakalkhahare-Sindhukot	23B023R	10.0	Not Motorable
Thakle-Talamarang	23B024R	9.0	Partly Motorable
Melamchi-Dhuseni	23B025R	10.0	Not Motorable
Dhusenichaur-Bhotechaur	23A026R	19.0	Partly Motorable
Jaisigaun-Pati Bhanjyang	23B028R	8.0	Partly Motorable
Sera-Golphu Bhanjyang	23A030R	10.1	Partly Motorable
Timbu-Goretoghyang	23B032R	19.7	Not Motorable
Melamchi-Nagidanda	23B034R	10.0	Partly Motorable
Melamchi-Tipeni	23A038R	7.8	Partly Motorable
Tipeni-Gunsakot-Majhuwa	23A039R	14.9	Partly Motorable
Chautara-Syaule	23A043R	6.0	Motorable
Balephi-Jalbire	23A046R	10.0	Motorable
Barhabise-Budhepa	23A051R	6.5	Partly Motorable
Kharidhunga-Piskar	23B053R	5.4	Not Motorable

Transport Linkages	Reference Number	Total Length (km)	Remarks
Thulopakhar (Satrakilo)-Petku	23B055R	3.0	Not Motorable
Mudhe-Deurali (Dolakha)	23A056R	1.5	Motorable
Piukharka-Barkhang	23A058A	7.4	Partly Motorable
Shramathali-Thokarpa-Chehere	23A059R	39.8	Partly Motorable

Source: Annex 3.01

**TABLE 2.4**

The socio-economic activities of the district still largely depend on trail-based transport and communication system depending on main and mule trails. Main trails provide access to the substantial region of the district and serve a larger number of pedestrian and porters. These are all-weather trails and mules are sometimes used for transportation on these trails.

### 2.5.2 Communication Infrastructure

As for the communication infrastructure in the district is concerned; postal service is the major means of communication. At present, every VDC has postal services and there are altogether 62 additional post offices, 12 Ilaka post offices, 4 local post offices and one district post office. Telecommunication, which is considered the most efficient means of communication, is still far below the district requirement. The main constraints for balanced communication systems in the district are rugged and difficult geography of the district, lack of complementary infrastructure like roads and electricity. Currently, only 24 VDCs have access to telecommunication. The district has therefore given due priority to extend telephone services in all VDCs within five years (2002-2006).

## 2.6 Agricultural Profile

Agriculture is the main source of income in the Sindhupalchowk district and about 93% of the population are dependent on it for their livelihood.

Following the land use analysis of the district (refer to map 6) the existing land resource base in the district has been broadly divided into cultivated land, forest/shrub, grassland and others. Distribution of the land resources among these categories indicate that forest covers most of the area of the district (44.4% or 1104.7 sq. km.) followed by cultivated land (29.0% or 723.2 sq. km.), grassland (5.0% or 125.4 sq. km), and others (21.6 % or 536.6 sq. km.) based on the topographic map of 1996. The total district area is 2489.9 sq. km.

The overall agricultural production pattern of the district is characterised by a high subsistence production and a relatively moderate surplus production. Despite the varied climatic opportunities for growing different high value and export potentials crops like large cardamom, ginger, orange, apple etc., the agricultural production system is subsistence in nature and market integration is indeed very limited.

A review of irrigation facilities in the district shows that only about 15 percent of the total cultivated land has irrigation facilities throughout the year. Although there are many sources of water, expansion of irrigation infrastructure in the district is quite difficult due to remoteness and difficult terrain. Due to the inadequate irrigation facilities it is very difficult to accelerate agricultural production and productivity.

The lack of irrigation facilities for the winter crops is still perceived to be a major bottleneck for winter and off-season farming. Therefore, upland and rainy season farming is the predominant farming practice in the district. The cropping pattern of Bari land, which covers the main area of cultivated land, is maize-millet. Paddy-wheat, paddy-maize, paddy-paddy are the major cropping patterns on irrigated Khet land.

### 2.6.1 Agricultural Production and Potential

The production system in the district is subsistence in nature with low level of input and output. Rice, maize, millet, wheat and potato are the major subsistence crops. Looking at the climatic and edaphic variations, the district has immense potential for off-season vegetable production, citrus and other fruits, bee keeping, spices crops, potato and potato seed production etc.

In spite of the favourable agro-climatic conditions in the district and very high cropping intensity (area of temporary crops divided by arable land), the income of farmers is rather low. The main reasons for this are the low percentage of land available for cultivation as well as the lack of adequate road network that leads to relatively high transportation cost of agricultural production. Moreover, lack of irrigation and unavailability and/or high cost of fertilisers are other factors impeding the growth and development of the agricultural sector.

The main crops of the district are maize, rice, millet and wheat. Potato and barley are produce in the high hills as staple crops and large volumes of potato are exported to Kathmandu every year. Cereals production is confined in the river basin and the high hills and mountain regions are insufficient in food grain production. Looking at the current productivity level of the major cereal grain, the average productivity is higher than the national average productivity. The current status production and productivity of major agricultural crops of the district is presented in Table 2.5

**Areas, Production and Productivity of Major Agricultural Crops**

S.N.	Crop	Area (ha)	Production (Mt)	Productivity (Mt/ha)	
				Sindhupalchowk	Nepal
1	Paddy	12,466	34,140	2.74	2.40
2	Maize	23,575	51,685	2.19	1.60
3	Millet	19,613	31,381	1.60	1.07
4	Wheat	11,630	25,934	2.23	1.41
5	Potato	3,003	29,669	9.88	9.64
6	Oilseed Mustard	1,415	933	0.66	0.65
7	Barley	600	786	1.31	0.95

Source: Periodic Plan of DDC Sindhupalchowk (057-064)

**TABLE 2.5**

Future investments on new roads and rehabilitation of existing roads will facilitate the provision of services and agricultural inputs such as seed, fertilisers etc. Further, it will provide access to markets for agricultural products and an economic access to different services. As a consequence the income of farmers from cash crops will substantially increase due to reduction in transportation cost from their farm to the road. This will lead to a gradual substitution of traditional subsistence farming by cash crop production. Looking at the present land use pattern and the climatic variability of the district, there is still opportunity to transforming low productive subsistence agriculture to market oriented high-input agricultural production systems through diversification and intensification of existing cropping systems. The district is endowed with varieties of climatic zones starting from warm sub-tropical like climate along the river basin to temperate and cold in the high altitude zone. This prevailing heterogeneity in the distribution of agricultural resource base in the district has provided the district with comparative advantage of growing varieties of crops with high demand.

### 2.7 Industrial Profile

Although the district does not hold any large-scale factories and industry except hydropower stations, many people practice some form of household/cottage industry based on agricultural and forest products. In the high hill areas, *Radi/Pakhi* weaving is a traditional industry. *Khukuri* making is another important cottage industry of the district. According to the record of District Cottage Industry Board, about 1000 industries are registered but less than half of the total registered industries are under operation. Amongst them, the maximum number agro-based industry (176)

followed by service related industry (100). Other industries are forest-based (60), tourism industry (5) and mine based industry (9), Hydropower (5) and others (53) like hosiery, sewing and stitching *Radi/Pakhi*, carpet etc.

## 2.8 Trends and Dynamics Observed

Main trends observed are related to the demographic dynamics in the district. As in many northern districts in the country, in and out-migration has almost stabilised substantially. The reason for this stabilisation may be the fact that since the 80's pressure on land and consequently the price of land in the *Terai* has increased considerably to the extent that people from the hill districts cannot afford to settle there anymore. However, after the opening of Arniko highway and Lamosanghu-Jiri road in late 70's the flow of inputs in the district has increased leading to a variety of goods being sold in the local market. The general consumption level has been increased to some extent. Since the local employment and economic opportunities within the district could not meet the demand for cash, the process of seasonal migration in the search of off-farm employment has further escalated.

Another important development trend observed is in the use of natural resources and the conversion of pasture land into forest and changes in the practice of livestock feeding from open grazing to stall feeding. Because of increased population in the district, a decreasing trend of per capita natural resource endowment such as land, forest etc. has been observed. This increased population size has further exerted on the land use pattern that has increased the cropping intensity in per unit of cultivated land. After the opening of strategic road network in the district, the import of commodities required for household use has increased substantially while the overall export from the district has not been increased accordingly. This is primarily due to the lack of transportation facilities to the agricultural potential pocket areas.

## 2.9 Export Potentials

Due to its proximity to Kathmandu the district has enormous potential of exporting both agro-based and non-agro-based products. Fruits, vegetables and dairy milk are the important agro-products with significant export potential. The district has therefore envisioned agricultural sector as a leading sector of the district development. Other than agricultural products, Non-Timber Forest Products (NTFPs) like *Chirato*, *Lokta* and other herbs like *Jatamasi*, *Kudki*, *Sugandhwal*, *Lothsalla*, *Nagbeli*, *Padamchal* etc are exporting from the district to Kathmandu every year. The Indrawati and Sunkoshi watershed areas are the most prominent places of producing NTFPs in the district. It is estimated that Sindhupalchowk district alone exports more than 50 tons of *Lokta* every year.

## 2.10 District Priorities

The district has given due priority in the balanced development of different sectors to improve the overall socio-economic condition of the district. Transportation is one of the high priority sectors of Sindhupalchowk district. Therefore, the district has given due emphasis on new construction, maintenance and rehabilitation of the existing district roads. The district has made its strategic vision to provide road access to each and every VDC in the next fifteen years.

Road corridors for consideration in DTMP were selected based on the presentation of existing scenario and survey findings, recommendations of the DRCC and the conclusions of the workshop in Sindhupalchowk in April 2000. DRCC and DDC proposed eight road sections as a new construction and nine road sections for rehabilitation and maintenance during the workshop to include in the study of District Transport Master Plan (DTMP). During the regional synchronisation workshop in December 2000 in Kathmandu the district priorities were confirmed and included in the DTMP. The final list of the road corridors proposed for the DTMP study is summarized in Table 2.5.

### Proposed DTMP Roads

Transport Linkages	Reference Number	Road Length	
		Maintenance/ Rehabilitation (km)	New Construction (km)
Shramthali-Thokarpa-Chehere	23A059R	39.8	
• Shramthali-Attapur		7.2	
• Attapur-Wafal			13.1
• Wafal-Chehere		19.5	
Sikre-Thulodhading	23A058A	14.0	
• Barkhang-Khordung			6.6
• Piukharka-Barkhang Basti		7.4	
Talamarang-Botechour-Sankhu	23A026R	27.7	
• Talamarang-Upallogaun			6.7
• Uppalogaun-Dhusenichaur		2.0	
• Dhusenichaur-Bhotechaur		19.0	
Melamchi-Bhotang	23A038R	31.5	
• Melamchi-Handikhola		11.0 (Maintained by Indrawati-III Hydropower Project)	
• Handikhola-Ksimti			20.5
Karkitar-Sukute	23A001R		4.5
Chautara-Syaule-Okhreni	23A043R	12.0	
• Chautara-Syaule		6.0	
• Syaule-Okhreni			6.0
Jalbire-Katike (Tembathan)	23A047R		13.7
Bahrabise-Budhepa	23A051R	6.5	2.0
Chautara-Sipaghat	23A011R	28.0	
Melchour-Bhainse	23A004R	11.0	
Chautara-Melamchi	23A014R	31.5 (Under construction by RCIW project)	
Phatkeshwor-Chhap Bhanjyang	23A020R	7.0	

Source: Annex 3.02

**TABLE 2.6**

The origin and destination of road corridors stated above have been identified based on its starting and end point that at least start or end at one of the service/market centre or linked with feeder road, highway or district road. On that aspect, a single road corridor constitutes of different road sections some of them are existing that required rehabilitation/maintenance works and others are proposed as a new construction (refer to Table 2.5).

Sindhupalchowk district has given a high priority for the maintenance and rehabilitation of existing road network in order to bring them up in the motorable condition. However, some new road corridors have also been identified and proposed for the construction in the area of relatively less road accessibility.

A brief description of each road corridors (sections) proposed by DRCC, DDC and based on the general assessment for the purpose of DTMP study is outlined hereunder.

### **Shramthali-Thokarpa-Chehere**

This corridor starts at Shramthali (Ekhai Kilo) on the Lamosanghu-Jiri road. The total length of this corridor is about 39.8 km, and initial section (Shramthali-Attarpur) 7.2 km and the end section (Wafal-Chehere) 19.5 km is existing road constructed as the fair weather earthen road and are open only for seasonal traffic. The remaining Attarpur-Wafal section which is 13.1 km is proposed as a new construction that will complete the whole corridor.

This is one of the important roads in the district providing access to a large number of populations living in the eastern part of the district to get access to Arniko highway in the south close to Balefi bazaar and Lamosanghu-Jiri road at Shramthali. The main VDCs served by this corridor are Attarpur, Sikre, Lisankhu, Wafal, Thokarpa, Chehere etc.

During the dry season two public buses operate regularly from Wafal to Chehere together with few mini trucks to transport goods. Similarly, Shamthali-Attarpur section has been limited and two buses and few mini trucks are plying during the dry season. These existing sections are rapidly deteriorating due to lack of maintenance, landslides and inadequate design and construction measures. Therefore, these two existing sections are proposed for the rehabilitation/maintenance works.

### **Sikre-Thulodhading**

The total length of this road corridor is about 14.0 km. This is an agricultural road which starts from Piukharka near Sikre bazar on Shramthali-Thokarpa-Chehere road. The Sharmathali-Thokarpa-Chehere road has direct linked with Lamosanghu-Jiri road that is linked with Kathmandu valley via Arniko Highway. The initial 7.40 km section of the Sikre-Thulodhading road corridor is already constructed as a fair weather road from Piukharka to Barkhang Basti with the use of bulldozer. The existing Piukharka-Barkhang section is being deteriorated due to lack of proper maintenance and therefore proposed for rehabilitation/maintenance works. The remaining 6.6 km of Barkhang-Khordung section is proposed for new construction.

This corridor mainly serves Attarpur and Thulodhading VDCs that lies in the south-east area of Sindhupalchowk district. The completion of this corridor will provide direct access to Lamosanghu-Jiri road to the population living in the south-east part of Sindhupalchowk district and other neighbouring villages from Kavre, Ramechhap and Dolakha district. It will help to provide access to work, market, service centres that will ultimately improve the socio-economic condition of the district.

### **Talamarang-Bhotechaur-Sankhu**

The total length of this road corridor is about 40.0 km and passes through Sindhupalchowk and Kathmandu districts. The existing 12.0 km Sankhu-Bhotechaur section and remaining 28.0 km Bhotechaur-Talamarang section lies in the Kathmandu and Sindhupalchowk district respectively. Out of 28.0 km of Bhotechaur-Talamarang section, a total length of 21.0 km from Bhotechaur to Uppalogaun is already being constructed and proposed for rehabilitation/maintenance works. The remaining Talamarang-Uppalogaun section that is about 7.0 km is proposed for the new construction. The existing Bhotechaur-Uppalogaun section is further divided into two sections Bhotechaur-Dhusenichar and Dhusenichar-Uppalogaun based on their present conditions. The Bhotechaur-Dhusenichar section is about 19.0 km long and requires only maintenance works to bring back into the operational conditions. However, the Dhusenichar-Uppalogaun section that is 2.0 km long and passes through a major slide and difficult terrain requires re-alignment and reconstruction.

The proposed Talamarang-Bhotechaur-Sankhu road corridor passes through five VDCs namely Talamarang, Sindhukot, Thakani, Haibung and Bhotechaur of Sindhupalchowk district. The completion of this corridor will link western part of Sindhupalchowk with Kathmandu valley and also connect with Paanchkhal-Melamchi-Helambu feeder road. This is one of the traditional trade

route from Sindhupalchowk to Kathmandu. It will also create economic opportunities for poor people to sell their agriculture products and labor to markets and service centres.

The serviceability of this corridor largely depends on the condition of Sankhu-Bhotechaur section (under Kathmandu district), and is equally important to maintain this part by Kathmandu district to keep it operational and more effective.

### **Melamchi-Bhotang**

The Melamchi-Bhotang corridor starts from Melamchi, one of the main market/service centres of the district. The total length of this proposed corridor is about 31.5 km where the initial 11.0 km of Melamchi-Handikhola section is already being constructed (7.0 km by Indrawati III Hydropower project). This existing section is being only used by the Indrawati III Hydropower project to transport construction materials and not open for public traffic. Consequently, the periodic maintenance work is also carried out by the project. The remaining Handikhola-Ksimti (Bhotang) section is proposed for new construction that is about 20.5 km long.

The proposed road will provide access to large numbers of the population from fifteen VDCs living in the north-west part of the district. It will pass through major settlements of six VDCs namely Jyamire, Langarche, Bhote Namlang, Thangpal Dhap, Thangpal Kot and Bhotang. The construction of this corridor will provide better access to the north-west part of the district to Melamchi market/service centre to export or import household commodities and agriculture products. It will further open the possibility of exporting local products to Kathmandu through Paanchkhal-Helambu feeder road that has a direct link with Arniko Highway.

The maintenance/rehabilitation of the existing Melamchi-Handikhola section is recommended to be carried out only after the completion of Indrawati III Hydropower project.

### **Karkitar-Sukute**

The total length of the Karkitar-Sukute road corridor is about 4.5 km and proposed for the new construction. The construction of this corridor road is important as it provides access to agricultural pockets with the Arniko Highway. Due to lack of access to potential market and higher transportation cost the agriculture products are not getting reasonable price. The completion of this corridor will also provide the possibility of exporting agriculture product to Kathmandu valley as well. The major agriculture products of this area is paddy, wheat, grain, maize, potato, fruits, vegetables etc.

### **Chautara-Syaule-Okhreni**

The Chautara-Syaule-Okhreni corridor starts from Chautara (district headquarters) and is approximately 12.0 km long. The initial 6.0 km long Chautara-Syaule section has already been constructed as a fair weather earthen road and opened for traffic. The existing section is being deteriorated in the absence of proper maintenance, water management works and inadequate design and therefore proposed for the maintenance/rehabilitation works. The remaining Syaule-Okhreni section that is also 6.0 km long is proposed for the new construction.

The Chautara-Syaule-Okhreni corridor is one of the main roads of the district that serves 12 VDCs of the northern part and linked with district headquarter. This corridor is also important from the tourism aspect that is being used as a trekking route to the tourism sites like Paanchpokhari and Gaurati temple. The construction of this corridor will also provide better access to the agriculture production area to export their product to bigger market. This area has also potential of exporting herbs and slate stone.

### **Bahrabise-Budhepa**

The total length of the proposed corridor is about 8.50 km that starts from Bahrabise, one of the main market/service centres of the district. The initial section of 6.5 km has already been constructed as fair weather earthen road with the use of bulldozer and proposed for the rehabilitation/maintenance works. The remaining 2.0 km is proposed for the new construction.

This corridor will mainly serve the VDCs located in the western part of Sindhupalchowk and other neighbouring VDCs from Dolakha district. The construction of this corridor will provide access to one of the major trade centre of the district located along the Arniko Highway. It will help to promote agriculture export and import of household commodities from Bahrabise and Kathmandu valley through Arniko Highway. This corridor will also provide access to the potential hydropower sites of Handikhola II and Handikhola IV.

### **Chautara-Sipaghat**

The existing Chautara-Sipaghat road corridor provides access from the district headquarter at Chatura to the service centre at Sipaghat located at Paanchkhal-Melamchi-Helambu feeder road. The total length of this corridor is about 28.0 km. The existing road is heavily deteriorated in the absence of proper maintenance works, erosion and landslides, and inadequate design. At present this road is not open for traffic and major rehabilitation is required to bring back it into operational condition.

### **Jalbire- Katike (Tembathan)**

This is the extension of Balefi-Jalbire road and the total length of the proposed road corridor is about 15.0 km. Initially DDC has proposed this corridor from Jalbire to Tembathan that is 60.0 km long and passes through the difficult terrain which requires considerable time and effort to carry out IEE and walkover survey. Therefore, DDC has agreed for consideration in the DTMP preparation up to Katike for a length of 15.0 km.

Jalbire-Katike road serves mainly to the northern part of the district. Before the construction of Arniko Highway, it was one of the major trade routes to Tibet. The road opens access to Langtang National Park and follows the trekking route to Langtang areas which will promote the tourism industry within the district. It will also provide access to the potential Pangarpu hydropower site.

### **Melchour-Bhainse**

The total length of the existing Melchour-Bhainse road corridor is about 11.0 km starting from Melchour to Bhainse. This corridor provides link between Dolalghat-Chautara feeder road and Arniko Highway. At present the road is opened only for fair-weather traffic and few trucks are moving occasionally due to landslides and erosion during the rainy season. A substantial rehabilitation works is required to bring back the road in smooth fair-weather vehicular movement. The DDC/DRCC has therefore proposed this road for maintenance/rehabilitation in the DTMP.

Since the corridor is linked with both Arniko Highway and Dolalghat-Chautara feeder road it provides the high possibility of getting better market for the agriculture products to the people residing in Irkhu and Kadambas VDCs.

### **Chautara-Melamchi**

The total length of this proposed corridor is about 31.5 km that starts from Chautara to the other main market/service centre Melamchi. This corridor is being constructed by RCIW project and the initial 21.0 km from Chautara to Nawalpur has already been completed. The remaining 10.0 km is under construction.

Chautara-Melamchi corridor will serve the south-west part of the district and VDCs like Nawalpur, Shikharpur, Pipaldanda, Jyamire etc. It provides the opportunity for importing and exporting household commodities and agriculture products to and from bigger market/service centres like Chautara and Melamchi. This corridor is linked with both Paanchkhal-Melamchi and Dolalghat-Chautara feeder road which is further connected with Arniko Highway. Therefore, it will significantly contribute in the improvement of the socio-economic condition of the district. Further, it also provides access to the potential Jyadi Khola hydropower project.

### **Phatkeswor-Chhap Bhanjyang**

Phatkeswor-Chhapbhanjyang is one of the existing roads of the district that is about 7.0 km long. This corridor starts from the Phatkeswor that lies in the Paanchkhal-Melamchi feeder road and

ends at Chhap Bhanjyang. It has been constructed by VDC fund without any feasibility study and proper technical design standards. The district has proposed this corridor for the maintenance/rehabilitation purpose.

During the walkover survey it has been noticed that the road passes through a fragile mountain terrain with soft and loose soil that is highly erodible in nature. It has a high risk of erosion and landslides and makes it costly for the maintenance/rehabilitation works. Therefore, it has been dropped from the DTMP due to serious environmental impact.

The above road corridors as mentioned in the table 2.5 are proposed by the district for the purpose of new construction and rehabilitation. However, the current status of the existing roads (partial) proposed for rehabilitation purpose is found to be not in standard that can be upgraded by the rehabilitation works only during the walk over survey. These corridors/sections are basically opened with the use of bulldozer and traffic is only operated in the initial stage. At present these are not under the traffic operation. Therefore, the following road corridors/sections originally proposed for the rehabilitation works by the district are revised and considered as the new construction based on the existing status for analysis and scoring purpose.

- Piukharka-Barkhang
- Uppalogaun-Dhusenichaur
- Barhabise-Budhepa

After the revision based on existing status of proposed roads the final list stand as follows for the purpose for rehabilitation and new construction.

#### Final list of the Road Corridors for the Purpose of Rehabilitation and New Construction

Transport Linkages	Reference Number	Road Length	
		Maintenance/ Rehabilitation (km)	New Construction (km)
Shramthali-Thokarpa-Chehere	23A059R	39.8	
• Shramthali-Attapur		7.2	
• Attapur-Wafal			13.1
• Wafal-Chehere		19.5	
Sikre-Thulodhading	23A058A		14.0
Talarang-Botechour-Sankhu	23A026R	27.7	
• Talarang-Dhusenichaur			8.7
• Dhusenichaur-Botechour		19.0	
Melamchi-Bhotang	23A038R	31.5	
• Melamchi-Handikhola		11.0(Maintained by Indrawati-III Hydropower Project)	
• Handikhola-Ksinti			20.5
Karkitar-Sukute	23A001R		4.5
Chautara-Syaule-Okhreni	23A043R	12.0	
• Chautara-Syaule		6.0	
• Syaule-Okhreni			6.0
Jalbire-Katike (Tembathan)	23A047R		13.7
Bahrabise-Budhepa	23A051R		8.5
Chautara-Sipaghat	23A011R	28.0	
Melchour-Bhainse	23A004R	11.0	
Chautara-Melamchi	23A014R	31.5 (Under construction by RCIW project)	
Phatkeshwor-Chhap Bhanjyang	23A020R	Dropped due to serious environmental impact	

Source: DRSP Field Survey 2001

**TABLE 2.7**

### 3. INDICATORS FOR DISTRICT TRANSPORT PLANNING FOR NEW CONSTRUCTION ROADS

As mentioned in Methodology (Volume I), the indicators for district transport planning prioritisation for new construction of roads reflect basically the existing situation within a discrete area of influence of a particular road corridor. The selected road corridors for the purpose of new construction of Sindhupalchowk district have been compiled in Table 2.5. The ranking of individual road corridors was done following the approved scoring system.

#### 3.1 Demography

Following the Methodology (Vol. I), chapter 3.7.1, the population along the different road corridors have been divided into two categories: population located in the inner and outer zone of influence. Whilst the inner zone of influence (IZI) as per definition comprises the total area left and right of the road corridor within 5 km and the outer zone of Influence (OZI) consists the area between 5 and 15 km. The zones of influence are reflected in the thematical Map no. 5.

Although the partial section is proposed for the purpose of new construction the total length and the population within IZI and OZI of total length is considered for scoring. It is considered that the whole population living within the influence zone of the complete road will get service after the construction of the particular section. The scoring of the individual road corridor based on population density is compiled in Table 3.1 and the most important/extreme linkages related to population are described below:

**Score of Proposed Roads Based on Demographic Characteristics**

Road Corridor	Length (km)	Total Pop. IZI	Total Pop. OZI	IZI Pop/km	OZI Pop/km	Scoring		Total Score (10)	Transformed Score (10)
						IZI (6)	OZI (4)		
Shramthali-Thokarpa-Chehere	39.80	10,601	0	266	0	0.2	0	0.2	<b>0.1</b>
Sikre-Thulodhading	14.00	2,921	0	209	0	0.1	0	0.1	<b>0.1</b>
Talamarang-Bhotechour-Sankhu	27.70	20,783	0	750	0	2.1	0	2.1	<b>2.0</b>
Melamchi-Bhotang	31.50	23,554	853	748	27	2.1	0.4	2.5	<b>2.4</b>
Karkitar-Sukute	4.50	1,082	0	241	0	0.1	0	0.1	<b>0.1</b>
Chautara-Syaule-Okhreni	12.00	4,322	0	360	0	0.6	0	0.6	<b>0.5</b>
Barhabise-Budhepa	8.50	14,737	2,264	1,734	266	6.0	4.0	10.00	<b>10.0</b>
Jalbire-Katike (Tembathan)	13.70	10,566	3,524	771	257	2.2	3.9	6.1	<b>6.0</b>

Source: Annex 3.1

**TABLE 3.1**

The proposed **Bahrabise-Budhepa** road corridor will provide service to maximum number of population per km of its length from IZI and OZI comprising of eight VDCs of Sindhupalchowk district. It is a very densely populated corridor with relatively shorter in length compared to the others. Consequently, this corridor is ranked first from demographic aspects with a maximum score of 10.0.

**Jalbire-Katike** road corridor is ranked second from demographic aspects with a total score of 6.0 out of 10. This corridor mainly received the score from OZI where the other corridors do not have OZI due to overlapping with IZI of nearest road.

**Melamchi-Bhotang** road corridor serves the large number of populations from 15 different VDCs situated in the north-west part of the district. It provides service to a considerable population located in the immediate zone of influence. The population serving along the IZI is 748 per km of road length. Therefore, it is ranked third from the demographic aspects.

**Talamarang-Bhotechaur-Sankhu** road corridor is ranked fourth with a total score of 2.0. It mainly serves the population from the south-west part of the district. It provides service to the large number of population from IZI but does not cover the area under OZI due to overlap with other corridor. The total population serving along the IZI per km road length is 750.

The remaining road corridor provides service only to a small number of populations and received the low score from demographic aspects. All the remaining road corridors serve only to the population within IZI due to OZI being overlapped with the nearest road corridor.

### 3.2 Agricultural Resources / Potentials

The scoring related to agricultural resources and potentials was carried out based on the area of land available for agriculture located in the inner and outer zone of influence of the different road corridors. As per definition the agricultural area within 5 km from both sides of the road corridor is within the IZI and the area between 5 and 15 km belongs to the OZI. The scoring of the individual road corridors based on above factor (Vol. I, 3.7.2) is compiled in Table 3.2 and the most important/extreme linkages related to agricultural resources and potentials described below:

**Score of Proposed Roads Based on Agricultural Resource Base**

Road corridor	Length (km)	Cultivated land area in IZI, (ha/km)	Cultivated land area in OZI, (ha/km)	Score		Total Score (15)	Transformed Score (15)
				IZI (10)	OZI (5)		
Shramthali-Thokarpa-Chehere	39.8	80	0	1.2	0	1.2	<b>1.0</b>
Sikre-Thulodhading	14.0	47	0	0.2	0	0.2	<b>0.1</b>
Talamarang-Bhotechaur-Sankhu	27.7	180	0	4.1	0	4.1	<b>4.0</b>
Melamchi-Bhotang	31.5	257	0	6.4	0	6.4	<b>6.2</b>
Karkitar-Sukute	4.5	39	0	0.2	0	0.2	<b>0.1</b>
Chautara-Syaule-Okhreni	12.0	244	0	6.0	0	6.0	<b>5.9</b>
Barhabise-Budhepa	8.5	343	8	8.9	0.4	9.3	<b>9.1</b>
Jalbire-Katike (Tembathan)	13.7	382	113	10.0	5.0	15.0	<b>15.0</b>

Source: Annex.3.2

**TABLE 3.2**

**Jalbire-Katike** road corridor has been assigned a maximum score of 15 and has high priority from the agricultural perspective due to comparatively large area of cultivated land within the inner and outer zone of influence.

**Bahrabise-Budhepa** road corridor is ranked second from the agricultural development perspective with a total score of 9.1 out of 15. It mainly received the score from IZI area which has 343 hectare of available cultivated land per km of road length.

**Melamchi-Bhotang** road corridor ranked third most important linkage from the agriculture development perspective. The total available cultivated land under IZI area is 257 hectares per km of road length.

**Chautara-Syaule-Okhreni** road corridor has been assigned a total score of 6.0 and ranked fourth from the agriculture development and potential.

Investments in transport will facilitate the provision of services like credit and agricultural inputs such as seed, fertilisers. It will provide access to services for agricultural products and an economic access to different services. As a consequence the income of farmers from cash crops will substantially increase due to reduction in transport cost from their farms to the road. This will lead to a gradual substitution of traditional subsistence farming by cash crop production.

There are opportunities in the district for transforming low productive subsistence agriculture to service oriented high-input high-output agricultural production systems through diversification and intensification of existing cropping pattern. The district is endowed with varieties of climatic zones starting from warm sub-tropical like climate along the river basin to cold temperate in the high altitude zone. Due to difference in climatic and edaphic condition and great heterogeneity in the distribution of agricultural resource base in the district described in terms of potential pocket areas for growing different crops with comparative advantage there are opportunities to grow both temperate as well as tropical crops. A complex set of farming can be practised after investments on transport.

There is a high potential for increased production of vegetables, potato and for intensification of production of other crops. An improved district road network will allow more economical transportation of the products to the Kathmandu valley through the existing Arniko Highway.

### 3.3 Economic Structure and Service Centres

The concentration of economic and social activities are at the major trading centres; Bahrabise, Lamosanghu and Jalbire. These market/service centres are located along the Arniko highway. The services like health, education, communication and electricity are much more concentrated at Bahrabise and Chautara. The other major service/market centres in the district are Melamchi and Sipaghat that are located along the Paanchkhal-Helambu road.

Based on the information collected during the field survey (Annex 3.3) a review of functions and services of service centres at the centre itself and in its catchment area has been carried out. Evaluation of the data applying the methodology described in Vol. I, 3.7.3 was carried out to determine the weightage of market/service centres. The scores for the road corridors have been derived from these weightage using the methodology given in Vol. I, 3.7.3 that are summarized in the table 3.3.

**Score of Proposed Roads Based on Services Provided by Existing Service Centres**

Road Corridor	Market/Service Centres	Total Weightage	Length (km)	Weightage per km of road length	Total Score (10)	Transformed Score (10)
Shramthali-Thokapa-Chehere	Lamosanghu	69.5	39.8	1.7	0.0	<b>0.4</b>
Sikre-Thulodhading	Lamosanghu	69.5	14.0	5.0	2.3	<b>2.3</b>
Talarang-Bhotechour-Sankhu	Melamchi	81.3	27.7	2.9	0.9	<b>0.9</b>
Melamchi-Bhotang	Melamchi	81.3	31.5	2.6	0.6	<b>0.6</b>
Karkitar-Sukute	Lamosanghu	69.5	4.5	15.4	10.0	<b>10.0</b>
Chautara-Syaule-Okhreni	Chautara	85.0	12.0	7.1	3.9	<b>3.9</b>
Bahrabise-Budhepa	Bahrabise	83.8	8.5	9.9	5.9	<b>5.9</b>
Jalbire-Tembathan	Jalbire	65.1	13.7	4.8	2.2	<b>2.2</b>

Source: Annex 3.3

**TABLE 3.3**

The evaluation of the data indicates that the district headquarter Chautara provides the maximum number of economic facilities and government services to district population. As a consequence **Chautara** receives the maximum score of 85.0 out of 100 (see Table 3.3) followed by **Bahrabise**, **Melamchi** and **Lamosanghu**. These service centres are located in the southern region of the district along the highway and strategic road and provide service to the inner plain area.

**Karkitar-Sukute** road corridor has received the maximum score of 10.0 due to location of the nearest service/market centre and shorter length of this road. Since the final score is calculated by dividing the total weightage of service/market centre by the length of the road there is a chance that the short length with bigger service centres will have higher scores.

This road corridor is followed by **Bahrabise-Budhepa**, **Chautara-Syaule-Okhreni** and **Sikre-Thulodhading** road with the scores of 5.9, 3.9 and 2.3 respectively.

### 3.4 Trade Flow / Predicted Changes

Most of the household commodities like kerosene, salt, cloth, rice etc. are transported to the main service/market centres from Kathmandu through Arniko Highway and strategic road. Further the imported commodities are transported to the various parts of the district from main service/market centres by the means of porter, mule etc. Melamchi and Sipaghat service/market centre serves the western and north-western part of the district, Chautara and Jalbire serves the northern part and Lamosanghu and Bahrabise serves the eastern and some adjoining areas of Dolakha district.

The trade flows within Sindhupalchowk district are reflected in map no. 7. The total transport cost of commodities was calculated based on the findings from the field survey. The flow of commodities included the flow in both directions from origin to destination and vice versa.

Generally, goods and commodities are transported by porters on the proposed road corridors throughout the year. On some proposed road corridors like Melamchi-Bhotang and Jalbire-Katike mules are also used to transport the commodities.

Following the section 3.7.4 of Methodology, the scores for trade flow has been assigned based on average transport cost per km and are presented in the Table 3.4.

**Scores of Proposed Roads Based on Volume of Trade Flow**

Road Corridor	Length (km)	Trade volume (Ton/Year)					Total Trade volume (ton/yr)	Average Transport cost (Rs/ton/km)	Yearly Average Transport cost (Rs/km/yr)	Total Score (15)	Transfor med Score (15)
		Porter	Mule/ horse	Mini-Truck	Bus	Other					
Shramthali-Thokarpa-Chehere	39.8	2,720					2,720	169	460,915	<b>7.7</b>	<b>7.7</b>
Sikre-Thulodhading	14.0	2,210					2,210	143	315,714	<b>5.2</b>	<b>5.2</b>
Talamarang-Bhotechaur-Sankhu	27.7	1,700		1,440			3,140	245	769,675	<b>13.1</b>	<b>13.1</b>
Melamchi-Bhotang	31.5	2,550	302				2,852	307	876,724	<b>15.0</b>	<b>15.0</b>
Karkitar-Sukute	4.5	102					102	178	18,133	<b>0.0</b>	<b>0.3</b>
Chautara-Syaule-Okhreni	12.0	1,700					1,700	83	141,667	<b>2.2</b>	<b>2.2</b>
Bahrabise-Budhepa	8.5	1,700					1,700	191	325,000	<b>5.4</b>	<b>5.4</b>
Jalbire-Katike (Tembathan)	13.7	1,700	208				1,908	219	417,788	<b>7.0</b>	<b>7.0</b>

Source: Annex 3.4

**TABLE 3.4**

Along the proposed **Melamchi-Bhotang** road corridor commodities are transported by porters and mules from Melamchi service/market centre. Bhotang is located in the north-west part of Sindhupalchowk district (refer to map 7) and provides service to substantial population of the district. Due to the high trade volume (2,852 ton/year) and the average transport cost (Rs 307/ton/km) the total transportation costs per year along this corridor is also higher and thus receives the maximum score of 15.

**Talamarang-Bhotechaur-Sankhu** road corridor, which provides the access to the western part of the district, has received the second highest score based on the total transport cost per km. The commodities are transported by porters and mini-truck during the dry season along this corridor. The trade flow is high due to the operation of the mini-truck in the initial section of the corridor from Sankhu to Uppalogaun. The average transport cost per ton per km of road length is Rs 245 that is the second most expensive. The total score received by this corridor is 13.1 and ranked second based on the volume of trade flow.

The existing trade volume on proposed **Shramthali-Thokarpa-Chehere** road corridor is 2,720 ton/year, a relatively high figure. The average transport cost per km per ton is rather low (Rs 169/ton/km) compared to the other road corridors due to the access from both ends. As a consequence this road corridor has the third highest score of 7.7 out of 15.0.

**Jalbire-katike** road corridor, which provides the access to the northern part of the district and is also the main trekking route to the Jugal Himalayas from Jalbire service/market centre. Although this corridor does not transport the high trade volume, it receives the significant score due to difficult alignment and high transport rate of commodities. The average transport cost per ton per km of road length is Rs 219 that is the third most expensive after the Talamarang-Bhotechaur-Sankhu road corridor. The total score received by this corridor based on the total transport cost per km is 7.0 out of 15.0 and ranked as fourth.

The scores received by other four road corridors based on the total transport cost per km of road length are relatively low that ranges from 0.3 to 5.2.

### 3.5 Development Potential

Other resources and activities along the individual road corridors, which are beyond the agricultural sector as described in 3.7.5 Volume I, are described and rated as development potentials. The main resources and activities are tourism development, agricultural and horticultural intensification, hydropower development, development of industry, market and service centres development etc., which may have synergetic development impact due to road construction, are considered under the heading of development potential.

There are few areas with distinct development potentials. The survey carried out with district representatives identified the following potentials (see annexes 3.5.1 to 3.5.8) with a high significance on the respective road corridors. Based on the survey the proposed road corridors have been related to their significance to development potential. The score of proposed road corridors based on their significance to development potentials is summarized below in Table 3.5.

### Scores of Proposed Roads Based on Development Potentials

Proposed roads	Length (km)	Total Weightage	Total Score (5)	Transformed Score (5)
Shramthali-Thokarpa-Chehere	39.8	2.6	1.0	1.0
Sikre-Thulodhading	14.0	2.6	1.0	1.0
Talamarang-Bhotechour-Sankhu	27.7	3.8	3.1	3.1
Melamchi-Bhotang	31.5	4.9	5.0	5.0
Karkitar-Sukute	4.5	2.0	0.0	0.8
Chautara-Syaule-Okhreni	12.0	2.6	1.0	1.0
Barhabise-Budhepa	8.5	3.4	2.4	2.4
Jalbire-Katike (Tembathan)	13.7	2.8	1.4	1.4

Source: Annex 3.5

**TABLE 3.5**

**Melamchi-Bhotang** road corridor will promote the hydropower and tourism industry in the district. This proposed corridor has also high potential for developing business and commerce and exporting timber and non-timber forest products. Melamchi is one of the main service/market centres from where most of the commodities are exported to the north-western part of the district. Therefore, this proposed road corridor receives the maximum score of 5.0 based on development potentials within and influence zone of road corridor.

**Talamarang-Bhotechaur-Sankhu** road corridor has high potential of producing potato, collecting herbs, and promoting business and trade within and influence zone of road corridor. This road corridor has also high potential of expanding and growing service/market centres. The total score of this proposed road corridor is 3.1 and ranked second from the development potential aspects.

**Bahrabise-Budhepa** road corridor will promote the non-timber forest products. This road will also promote the trade of mines (slates and magnetises), livestock farming, trade flow and timber products that can be exported to Bahrabise and Kathmandu valley via Arniko highway. As a consequence this road corridor ranked third with the total score of 2.4.

**Jalbire-Katike** road corridor will provide easier access to Jugal Himal and Dugunagadhi, the potential site for the tourism in the district and will promote the growth of tourism industry in the area. It will also provide access to the location of the potential Pangarpu hydropower project with the capacity of 16 KW. The total score received by this proposed road corridor is 1.4 out of 5.0 and ranked as fourth.

The other road corridors have relatively lower development potentials and consequently receive the low score ranging from 0.8 to 1.0 in comparison to the above high ranked road corridors.

### 3.6 District Priorities

A preliminary selection of road corridors was made based on the preliminary survey data and the recommendations by the DRCC and also on the recommendations made during VDC and Ilaka level workshop in June 2000 workshop at Sindhupalchowk. A consensus was reached about the priorities during a first workshop in Kathmandu in December 2000. These priorities were ranked between 0 and 5 and the list was finalised as shown in Table 3.6.

### Scores of Proposed Roads Based on District Priorities

Proposed roads	Total Marks given	Total Score (5)	Transformed Score (5)
Shramthali-Thokarpa-Chehere	5.0	5.0	5.0
Sikre-Thulodhading	3.5	1.3	1.3
Talamarang-Bhotechour-Sankhu	5.0	5.0	5.0
Melamchi-Bhotang	4.0	2.5	2.5
Karkitar-Sukute	3.0	0.0	1.1
Chautara-Syaule-Okhreni	3.5	1.3	1.3
Barhabise-Budhepa	3.0	0.0	1.1
Jalbire-Katike (Tembathan)	4.0	2.5	2.5

Source: Annex 3.6

**TABLE 3.6**

The district has clearly prioritised four main road corridors Shramthali-Thokarpa-Chehere in the east, Talamarang-Bhotechour-Sankhu in the west which are partly constructed and Melamchi-Bhotang in the north-west and Jalbire-Katike in the northern part of the district.

### 3.7 Tentative Construction Costs of Proposed Roads

The initial construction cost estimate covers the total cost for the new construction and reconstruction cost of existing to a maintainable standard of the individual road linkages. The rating of the whole corridor is done based on the average construction cost per kilometre of the section proposed for new construction. Consequently, the lowest costs, i.e. cheapest road linkages get the highest scores.

The table presented below is the summary of an initial cost estimate and the engineering rating:

**Summary of Initial Cost and Engineering Rating of Proposed Roads**

Road Corridor	Length (km)	Total Cost (NRs)	Cost per km (NRs)	Engineering Rating	
				Total Score (20)	Transformed Score (20)
Shramthali-Thokarpa-Chehere (Attarpur-Wafal)	39.8 (13.1)	26,724,000	2,040,000	0	2.0
Sikre-Thulodhading	14.0	22,182,000	1,585,000	8.5	8.5
Talamarang-Bhotechour-Sankhu (Talamarang-Dhusenichaur)	27.7 (8.7)	16,776,000	1,930,000	2.1	2.1
Melamchi-Bhotang (Handikhola-Ksimti)	31.5 (20.5)	31,775,000	1,550,000	9.1	9.1
Karkitar-Sukute	4.5	7,380,000	1,640,000	7.5	7.5
Chautara-Syaule-Okhreni (Syaule-Okhreni)	12.0 (6.0)	9,480,000	1,580,000	8.6	8.6
Barhabise-Budhepa	8.5	8,215,000	970,000	20.0	20.0
Jalbire-Katike	13.7	24,934,000	1,820,000	4.1	4.1

Source: Annex 3.7

Note: Figure in the parenthesis indicate the section and length proposed for new construction

**TABLE 3.7**

From the analysis it is observed that Barhabise-Budhepa road corridor is the most economical and hence has achieved the highest score of 20.0. The other road corridors that appeared in the top four positions are Melamchi-Bhotang, Chautara-Syaule-Okhrene and Sikre-Thulodhading with the scores of 9.1, 8.6 and 8.5 respectively.

### 3.8 Environmental Issues / Predicted Impacts

During the walkover survey carried out by the District Technical Team the preliminary environmental profile of the road corridor and potential environmental implications of the proposed road were assessed. Besides the description of the profile of the road link, water bodies, topography, geology, vegetation, socio-economic, etc. also have been described. Out of all the aspects, the significance of negative environmental impacts has been considered and rated in Table 3.8.

The following summary describes the environmental aspects of the individual road corridors.

#### a) Shramthali-Thokarpa-Chehere

The 13.0 km stretch of the road that remains to be constructed mainly passes through settlement area and thin community forest. Bagar khola and Tsheng khola are the major streams that are perennial and spring fed, where minor bridges would be required. Landslide prone areas exist at km 9.0 and km 26.0 where partial constructed have been completed. Potato farming exists along the Attarpur VDC section and Pear fruit farming in the Lishankhu VDC. Kakaling area, with its scenic beauty has the potential to attract tourists.

#### b) Sikre-Thulodhading

Approx. 7.5km of the total stretch of 14.0 km is a motorable stretch, which is constructed by bulldozer using local resources in the past. Due to the application of ad hoc construction methods along the existing motorable section landslides are prone at locations, km 1+900, km 3+300, km 4+200, km 4+700 and km 6+000. Approx. 40% of the proposed alignment passes through community forests and grazing land while the rest is cultivated land with scattered settlement. Gauri khola, Damani khola, Sinduopa khola and Poldung khola are the major streams of perennial spring fed nature along the proposed alignment which are fordable during the dry season. Sweet orange is grown in the Khordung area.

#### c) Talarang-Bhotechour-Sankhu

The proposed section between Upalogaon to Talarang is 7.0 km long section passes mainly through thin forest and partially by cultivated terraces. The community forest in the proximity of Tallogaon and Majhgaon extends for 1.0 km of the proposed alignment. The hill slopes extend upto 30°. Only minor kholsis are exists along the proposed road section. Steep hard rock section is encountered along the proposed road corridor at the proximity of km 6+800.

#### d) Melamchi-Bhotang

The 20.5 km long proposed new road from Handi khola to Ksimiti passes through major settlements like Thale, Kot gaon, Raithane, Manekharka, Majihuwa and Yarsa. The proposed road follows stable ridge alignment and hill slopes which are less vulnerable to landslides. Approx 2.0 km length of the proposed road alignment near Kot gaon and Raithane corridor passes through rocky area. Hill slope failure and slides exists along the existing road section between 0+000 to 7+000 due to heavy use of explosives for the tunnel and use of the road surface as irrigation canal. The pokhari at Raithani (km 21+000) is considered as a holy place with melas during the Teez festival.

#### e) Karkitar-Sukute

The proposed road is approx. 4.5 km long and ascends from an altitude of 670m at Sukute to 1050m at Karkitar. The proposed road alignment corridor mainly passes along the ridge and

hence possibilities slope failure is minimum if adequate measures are adopted during construction. Only small streams which dry up in the dry seasons exist along the proposed alignment. Thin pine community forest exists at the Karkitar end.

**f) Chautara-Saule-Okhreni**

The proposed new alignment between Syaule-Okhreni runs along the ridge at 1500m and only minor water crossings will be required. The proposed road shall benefit the people to travel to the temple at Gaurati, and Panchpokhari could benefit by attracting more tourists to the area. Though the proposed road corridor is sparsely vegetated herbs like chiraito grow in the region.

**g) Barhabise-Budhepa**

The proposed alignment ascends all the way from Barhabise at 870m to 1200m at Budhepa. Minor streams and water falls exists along the proposed alignment. The gradient and switchbacks have to be improved along the existing road alignment. Minor slips have occurred along the existing section of the road, caused mainly due to faulty construction. Chilaune and Sal are the prominent species found along the thin forest that exist within the road corridor.

**h) Jalbire-Katike**

The linkage between Jalbire and Katike was a popular route in the past used for trade between Tibet and Nepal. The proposed road alignment is approximately 14km in length wherein 8.3km long track has been opened by a bulldozer. The section of the road excavated by bulldozer contains high gradient sections and major slips at km 1+300 and km 3+900 along the alignment. The proposed alignment ascends from Jalbire at an altitude of 850m up to 1120m at Katike along the Jalbire river. Bokse khola, Baramchi khola, Toptu khola and Sun khola are the rivers along the proposed road alignment. The initial 3.0 km of the proposed alignment passes through fertile agricultural land.

**Score of Proposed Roads Based on Predicted Environmental Impacts**

Road Corridor	Length (km)	Environmental Rating					
		Minimum	Significant	Serious	Score	Total Score (10)	Transformed Score (10)
Shramthali- Thokarpa-Chehere	39.8	30	7	0	3	1.4	1.4
Sikre-Thulodhading	14.0	29	8	0	2	0.0	1.0
Talarang-Bhotechour-Sankhu	27.7	35	2	0	8	8.6	8.6
Melamchi-Bhotang	31.5	32	5	0	5	4.3	4.3
Karkitar-Sukute	4.5	35	2	0	8	8.6	8.6
Chautara-Syaule-Okhreni	12.0	36	1	0	9	10.0	10.0
Barhabise-Budhepa	8.5	35	2	0	8	8.6	8.6
Jalbire-Katike (Tembathan)	13.7	30	7	0	3	1.4	1.4

Source: Annex 3.8

**TABLE 3.8**

In conclusion, indications from the initial environmental walk over survey show that there could be significant environmental effects along some of the road corridors (See Table 3.8). However, it was found that none of the roads included in DTMP selection needed substantial environmental measures. In order to ascertain the environmental effects, detailed environmental examination of the proposed road alignment will need to be carried out before construction begins.

### 3.9 Social Issues and Transformations

Better access to areas with resource potentials through improved transport infrastructure is expected to enhance economic growth and open up better opportunities also to the poorest social strata in the district. Therefore by means of this indicator road corridors in areas with the highest density of people living in poverty will get highest priority. In order to identify households living below the poverty line a food sufficiency survey conducted by DDC in the proposed road corridors was considered. The results are compiled in Table 3.9.

#### Population in Poverty in the Influence Area of the Proposed Road and Score of Roads

Road Corridor	Length (km)	Total Pop. of IZI+OZI	Total Ultra Poor Pop. of IZI+OZI	Total Poor Pop. of IZI+OZI	Pop. Per km road length		Score			Transformed Score (10)
					UP	P	UP (6)	P (4)	Total (10)	
Shramthali- Tholarpa-Chehere	39.8	10,602	535	5,366	13	135	0.1	0.7	0.8	0.2
Sikre-Thulodhading	14.0	2,921	188	1,874	13	134	0.1	0.7	0.8	0.2
Talamarang-Bhotechour-Sankhu	27.7	20,784	1,789	8,469	65	306	0.8	2.1	2.8	3.8
Melamchi-Bhotang	31.5	24,409	1,617	8,458	51	269	0.6	1.8	2.3	2.9
Karkitar-Sukute	4.5	1,082	130	476	29	106	0.2	0.5	0.7	0.2
Chautara-Syaule-Okhreni	12.0	4,323	547	3,749	46	312	0.5	2.1	2.6	3.4
Barhabise-Budhepa	8.5	17,002	3,592	412	423	48	6.0	0.2	6.2	10.0
Jalbire-Katike (Tembathan)	13.7	14,093	2,180	7,507	159	548	2.1	4.0	6.1	9.8

Note: P = Poor, UP = Ultra Poor; Pop. = Population

Source: Annex 3.9

**TABLE 3.9**

With the largest population of ultra poor per km of road Barhabise-Budhepa road corridor received the highest score of 10.0 followed by Jalbire-Katike (Tembathan), Talamarang-Bhotechaur-Sankhu and Chautara-Syaule-Okhreni with the score of 9.8, 3.8 and 3.4 respectively. The score of other road corridors are ranging from 0.2 to 2.9.

### 3.10 Aggregation of Scores from all Nine Scoring Indicators

The total scoring of all indicators per road corridor has been compiled in Table 3.10. The rating of the individual indicators is explained in the respective chapters. The overall finding of the scoring exercise is that roads located in the inner plain areas receive a higher priority over roads located in the hills. The construction cost of roads in the inner plain is lower and less environmental mitigation measures have to be considered.

### Prioritisation of Individual Road Corridors for New Construction

Road Corridor	Parameters Used for the Prioritisation of Road Corridors for New Construction and Their Corresponding Scores										
	Demography (10)	Agriculture (15)	Service Centres (10)	Trade flow (15)	Development Potential (5)	District Priority (5)	Construction Cost (20)	Environment (10)	Social Aspects (10)	Total Score (100)	Rank
Shramthali-Thokarpa-Chehere	0.1	1.0	0.4	7.7	1.0	5.0	2.0	1.4	0.2	18.9	8
Sikre-Thulodhading	0.1	0.1	2.3	5.2	1.0	1.3	8.5	1.0	0.2	19.6	7
Talamarang-Bhotechaur-Sankhu	2.0	4.0	0.9	13.1	3.1	5.0	2.1	8.6	3.8	42.6	4
Melamchi-Bhotang	2.4	6.2	0.6	15.0	5.0	2.5	9.1	4.3	2.9	48.1	3
Karkitar-Sukute	0.1	0.1	10.0	0.3	0.8	1.1	7.5	8.6	0.2	28.5	6
Chautara-Syaule-Okhreni	0.5	5.9	3.9	2.2	1.0	1.3	8.6	10.0	3.4	36.7	5
Barhabise-Budhepa	10.0	9.1	5.9	5.4	2.4	1.1	20.0	8.6	10.0	72.5	1
Jalbire-Katike (Tembathan)	6.0	15.0	2.2	7.0	1.4	2.5	4.1	1.4	9.8	49.4	2

Source: Annex 3.10

**TABLE 3.10**

The findings of the scoring system indicate that four roads namely Barhabise-Budhepa, Jalbire-Katike (Tembathan), Melamchi-Bhotang and Talamarang-Bhotechaur-Sankhu have top priorities for the construction. A comparison of findings among these roads indicates that scores of Barhabise-Budhepa, Jalbire-Katike (Tembathan), Melamchi-Bhotang and Talamarang-Bhotechaur-Sankhu are higher in comparison to other roads. Their scores are 72.5, 49.4, 48.1, and 42.6 respectively.

The importance, advantage and other details of top priorities road corridors are explained briefly in the following sections:

#### **Barhabise-Budhepa**

The total score of this road corridor is 72.5 and ranked first. This corridor has received a maximum score from construction cost (20.0), demographic aspects (10.0), social aspects (10.0), agriculture land (9.1) and environmental issues (8.6). The construction of this corridor will open up access to the service/market centres from large agricultural producing area in the western region. It will reduce the transport cost of agricultural exports to market centres at Barhabise located on Arniko Highway that can be further exported to Kathmandu valley. It will also promote the export of herbs and potato from pocket areas with surplus production. This road corridor will serve a large number of populations from the western and the eastern region of Sindhupalchowk and Dolakha districts and will promote the growth of the market centre at Barhabise. This corridor will also provide the access to the potential hydropower site of Handikhola II and IV.

#### **Jalbire-Katike (Tembathan)**

The proposed Jalbire-Katike (Tembathan) road corridor provides service to one of the poor and food deficit region of the district. It has been assumed that about 90% of population from this region are very poor. This road corridor has the maximum score from agricultural land availability (15.0), social aspects (9.8), trade flow (7.0) and demographic aspects (6.0). This corridor is ranked second with the total score of 49.4.

The main cash crops of the land located at lower altitudes are potato and citrus. Farmers residing more than 10 km away from the market currently cannot enhance their income from cash crops due to high transportation cost. The construction of this corridor will provide access to service/market

centres at Jalbire and reduce the transportation cost. This will further enhance potato and citrus export from the pocket area to the service/market centres. There is also potential for establishing micro-hydro schemes in this area at Pangarpu Khola.

### **Melamchi-Bhotang**

The total length of Melamchi-Bhotang corridor is 31.5 km approximately. This corridor is ranked third with the total score of 48.1 out of 100.0. The maximum score received from different aspects are trade flow (15.0), construction cost (9.1) and agriculture land availability (6.2). The construction of this corridor will help to promote the tourism industry within and outside the district. This route is a major gateway to the trekking tourist visiting to the Langtang National Park. At present, a large number of tourist trek from Melamchi to the Langtang National Park located in Sindhupalchowk district.

The completion of this corridor will provide better access to export agriculture product to the main service/market centre Melamchi of the district and further it can be exported to Kathmandu valley via the existing strategic road that has a direct link with Arniko Highway. The major local agro-based products of the area are potato, herbs (Lokta) and dairy farming. It will also provide the access to the potential hydropower site of Handikhola I and III.

### **Talamarang-Bhotechaur-Sankhu**

The proposed Talamarang-Bhotechaur-Sankhu road corridor is ranked fourth with the total score of 42.6. The road provides service to a large number of populations from VDCs located in the north-western region of the district. The maximum score received by this corridor are from trade flow (13.1), environmental issues (8.6) and district priority (5.0).

The major agricultural products of this region are potato, citrus, vegetables etc. The people residing far from the service/market centre could not receive a good price of their products due to inaccessibility. After the construction of this corridor, the life status of the people will substantially improve. They will be able to sell their cash crops, herbal plants and livestock from the area to the market for the better price. It is expected that the trade flow from this region to Kathmandu valley will increase after the construction of this road that is at the border of Kathmandu and Sindhupalchowk district.

The score of other four road corridors are ranging from 18.9 to 36.7 and have low priority compared to the corridors explained above.

## 4. PARAMETERS USED FOR PRIORITISATION OF EXISTING ROADS FOR REHABILITATION

For the purpose of prioritisation of the existing road corridors for rehabilitation and maintenance a separate scoring system different than new construction road is considered which is elaborated in the Methodology (refer to Chapter 3.9, Volume I). The scoring system for rehabilitation and maintenance is broadly based on DoLIDAR manual 'Approach for the Development Approach of Department of Local Infrastructure and Agricultural Roads (DoLIDAR). However, some more indicators like traffic movement (volume) and agricultural export are also used.

### 4.1 Demography

The absolute number of people living within the combined IZI and OZI of the road corridor is considered as the indicator for this parameter as outlined in the Methodology (refer to Chapter 3.9.1). The maximum score of 10 is assigned for this indicator, and scoring is done based on the total number of people living per km of road length. In the case of partial section of the total road corridor required for the rehabilitation, the total number of people living within the whole corridor and total length of the road is considered for the scoring purpose. It is evident that the people within the whole corridor will be benefited after the rehabilitation of the poor section.

The scoring of the individual road corridor/section based on the total population served is compiled in table 4.1.

#### Scoring of Proposed Roads for Rehabilitation Based on Demographic Characteristics

Road Corridor (Section for Rehabilitation)	Length km	Total Population within IZI	Total Populatio n within OZI	Total Population	Population per km of Road Length	Total Score (10)	Transfor med Score (10)
Shramthali-Thokarpa-Chehere (Shramthali-Attarpur)	39.8 (7.2)	10,601	0	10,601	266	0	0.6
Shramthali-Thokarpa-Chehere (Wafal-Chhere)	39.8 (195)	10,601	0	10,601	266	0	0.6
Talamarang-Bhotechour- Sankhu (Dhusenichaur- Bhotechaur)	27.7 (19.0)	20,783	0	20,783	750	10.0	10.0
Melchaur-Bhainse	11.0	3,271	0	3,271	297	0.6	0.6
Chautara-Syaule-Okhreni (Chautara-Syaule)	12.0 (6.0)	4,322	0	4,322	360	1.9	1.9
Chautara-Sipaghat	28.0	13,557	0	13,557	484	4.5	4.5

Source: Annex 4.1

Note: Figures in the parenthesis indicate section and length of existing roads proposed for rehabilitation

TABLE 4.1

The evaluation of the data indicates that the **Dhusenichau-Bhotechaur** section of Talamarang-Bhotechaur-Sankhu road corridor serve the highest number of population per km of road length within the influence zone and consequently receives the maximum score of 10 and ranked first. The other two road corridor namely **Chautara-Sipaghat** and **Chautara-Syaule-Okhreni** ranked second and third with the total score of 4.5 and 1.9 respectively

### 4.2 Agricultural Exports

The road corridors are prioritised based on the volume of agricultural exports that are transported along the road or road corridor if the road is closed or in bad condition as outlined in Chapter 3.9.2 of Methodology (Volume I). For the purpose of comparison between different road corridors the volumes of the various agriculture exports including livestock are converted to cash values at local

prices. The maximum score of 10 is assigned for this indicator and scoring is done based on the total value of agricultural produce exported per km of road length. The total volume transported along the whole corridor is considered for the purpose of scoring even in the case of partial section of a road corridor is required for rehabilitation.

The scoring of the individual road corridor/section based on the total value of agricultural product exported is compiled in table 4.2.

### Scoring of Proposed Roads for Rehabilitation Based on Values of Agricultural Products Export

Road Corridor (Section for Rehabilitation)	Length (km)	Total Export Value Based on Farm-gate Price (Rs 000)	Value of Agricultural Product per km of Road Length (Rs000)	Total Score (10)	Transforme d Score (10)
Shramthali-Thokarpa-Chehere (Shramthali-Attarpur)	39.8 (7.2)	7,520	189	0	3.8
Shramthali-Thokarpa-Chehere (Wafal-Chhere)	39.8 (19.5)	7,520	189	0	3.8
Talamarang-Bhotechour- Sankhu (Dhusenichaur- Bhotechaur)	27.7 (19.0)	7,319	264	5.4	5.4
Melchaur-Bhainse	11.0	3,460	315	8.9	8.9
Chautara-Syaule-Okhreni (Chautara-Syaule)	12.0 (6.0)	3,760	313	8.9	8.9
Chautara-Sipaghat	28.0	9,221	329	10.0	10.0

Source: Annex 4.2

Note: Figures in the parenthesis indicate section and length of existing roads proposed for rehabilitation

**TABLE 4.2**

The evaluation of the data indicates that the **Chautara-Sipaghat** road corridor exports the highest value of agricultural products per km of road length and consequently receives the maximum score of 10 and ranked first. The major agricultural products exported from this corridor are potato, vegetables and milk. Likewise, **Melchaur-Bhainse** and **Chautara-Syaule** road corridors are ranked second and third with the total score of 8.9 each.

### 4.3 Market / Service Centres

The same methodology is employed to gather information, analyse the data and scoring system as that used for new road comparisons (refer to Volume I, 3.7.3). The maximum score of 10 is assigned for this indicator and scoring is done based on the weightage of the service/market centres that is located within IZI and OZI. The total length and service/market centre within IZI and OZI of that corridor is considered for the scoring purpose even in the case of the partial section proposed for rehabilitation.

The scoring of the individual road corridor/section based on the weightage provided by service/market centres per km of road length is summarized in table 4.3.

### Scoring of Proposed Roads for Rehabilitation Based on Services Provided by Existing Market and Service Centres

Road Corridor (Section for Rehabilitation)	Market/Service Centres	Market/Service Centres' weightage	Total Weightage	Length (km)	Weightage per km of Road	Total Score (10)	Transformed Score (10)
Shramthali-Thokarpa-Chehere (Shramthali-Attarpur)	Lamosanghu	69.5	69.5	39.8 (7.2)	1.7	0	0.6
Shramthali-Thokarpa-Chehere (Wafal-Chhere)	Lamosanghu	69.5	69.5	39.8 (19.5)	1.7	0	0.6
Talarang-Bhotechour-Sankhu (Dhusenichaur-Bhotechaur)	Melamchi	81.3	81.3	27.7 (19.0)	2.9	1.0	1.0
Melchaur-Bhainse	Chautara	85.0	154.5	11.0	14.0	10.0	10.0
	Lamosanghu	69.5					
Chautara-Syaule-Okhrene (Chautara-Syaule)	Chautara	85.0	85.0	12.0 (6.0)	7.1	4.3	4.3
Chautara-Sipaghat	Chautara	85.0	137.6	28.0	4.9	2.6	2.6
	Sipaghat	52.6					

Source: Annex 4.3

Note: Figures in the parenthesis indicate section and length of existing roads proposed for rehabilitation

**TABLE 4.3**

The assessment of the service provided by the existing market/service centres along the road and its influence zone indicates that the **Melchaur-Bhainse** road corridor receives the maximum score of 10. The two main service/market centres of the district Chautara and Lamosanghu is located along its influence zone. The **Chautara-Syaule** and **Chautara-Sipaghat** road corridors are ranked second and third with a score of 4.3 and 2.6 respectively.

#### 4.4 Traffic Volume

One of the main parameter for the prioritisation of the existing roads for the rehabilitation purpose is the traffic volume operating on the particular road. Most of the district roads proposed for rehabilitation is fair weather earthen road and not open for traffic throughout the year. Therefore, the annual average daily traffic (AADT) is calculated based on the average daily traffic (ADT) multiplied by the number of days the road is open for traffic. The traffic coefficients assigned for each mode given in DoLIDAR's "Approach for the Development of Rural and Agricultural Roads" as outlined in the Methodology (refer to chapter 3.9.4, Vol. I) is also considered to derive the AADT. Since traffic volume is taken as one of the key parameters for assessing the relative importance of the road, the highest score of 25 is assigned. The road with highest AADT expressed in terms of traffic unit (coefficients) receives the highest score.

The scoring of proposed roads for rehabilitation based on traffic volume is compiled in Table 4.4.

### Scoring of Proposed Roads for Rehabilitation Based on Traffic Volume

Road Corridor (Section for Rehabilitation)	No. of Days Road is Open for Traffic per Year	Average Daily Traffic (ADT)						Annual Average Daily Traffic (AADT) in TC	Total Score (25)	Transf ormed Score (25)
		Bus	Mini bus	Truck	Mini truck	Tractor	Oth ers			
Shramthali- Thokarpa- Chehere (Shramthali- Attarpur)	340	4		8				16,320	16.6	<b>16.6</b>
Shramthali- Thokarpa- Chehere (Wafal- Chhere)	270	6						6,480	4.4	<b>4.4</b>
Talarang- Bhotechaur- Sankhu (Dhusenichaur- Bhotechaur)	340	8			12			23,120	25.0	<b>25.0</b>
Melchaur-Bhaise	210	2			2			2,940	0	<b>2.0</b>
Chautara-Syaule- Okhreni (Chautara-Syaule)	270	2			10			10,260	9.1	<b>9.1</b>
Chautara- Sipaghat	340			6				8,160	6.5	<b>6.5</b>

**TABLE 4.4**

Source: Annex 4.4

Note: Figures in the parenthesis are section and length of the road proposed for rehabilitation

TC: Traffic Coefficients

The data analysis of the AADT along the proposed road corridors indicates that the **Dhusenichaur-Bhotechaur** section of the Talarang-Bhotechaur-Sankhu road corridor receives the highest score of 25.0. It is opened for the regular bus service and mini-truck for transporting people and commodities from Bhotechaur to Dhesenichar for about 340 days in a year. An average of 4 buses is operating back and forth per day along this corridor. The pavement surface is in satisfactory condition that requires minimum rehabilitation measures in certain stretch. Similarly, **Shramthali-Attarpur** and **Chautara-Syaule** sections are ranked second and third with a score of 16.6 and 9.1 respectively.

#### 4.5 Rehabilitation Cost

The other important parameter for the prioritisation of roads for rehabilitation is the estimated cost for rehabilitation. The initial rehabilitation cost estimate covers the total costs for the reconstruction cost of existing road to a maintainable standard of the individual road corridor (section). The maximum score of 25 is assigned for this parameter and the scores are distributed proportionately as the cheapest road corridors (sections) per km of road length get the highest score.

The scoring of the individual road corridor/section based on the reconstruction cost per km of road length is summarized in table 4.5.

### Scoring of Proposed Roads for Rehabilitation Based on Rehabilitation Cost

Road Corridor (Section for Rehabilitation)	Length (km)	Total Rehabilitation Cost(NRs)	Cost per km (NRs)	Engineering Rating	
				Score (25)	Transformed Score (25)
Shramthali-Thokarpa-Chehere (Shramthali-Attarpur)	39.8 (7.2)	4,104,000	570,000	14.8	14.8
Shramthali-Thokarpa-Chehere (Wafal-Chhere)	39.8 (19.5)	10,335,000	530,000	16.4	16.4
Talamarang-Bhotechour-Sankhu (Dhusenichaur-Bhotechaur)	27.7 (19.0)	6,080,000	320,000	25.0	25.0
Melchaur-Bhainse	11.0	5,170,000	470,000	18.9	18.9
Chautara-Syaule-Okhreni (Chautara-Syaule)	12.0 (6.0)	2,400,000	400,000	21.7	21.7
Chautara-Sipaghat	28.0	26,040,000	930,000	0	9.0

**TABLE 4.5**

Source: Annex 4.5

Note: Figures in the parenthesis indicate section and length of existing roads proposed for rehabilitation

The above data indicates that the **Dhusenichur-Bhotechaur** section of Talamarang-Bhotechaur-Sankhu corridor is ranked best with the score of 25.0. The rehabilitation cost per km length of road for this section is the cheapest one. It requires only minor rehabilitation measures to keep it under operational condition. Similarly, **Chautara-Syaule** and **Melchaur-Bhainse** sections/corridors are ranked second and third with the score of 21.7 and 18.9 respectively.

#### 4.6 Maintenance Costs

The last parameters considered for the prioritisation of the existing roads for rehabilitation is based on the maintenance cost score. The maintenance cost score is determined by taking different criteria into account as described in the Methodology (refer to chapter 3.9.6, Vol.I). The maximum score of 20.0 is assigned to the road corridor that required the low maintenance cost.

The details of the scoring based on maintenance cost required for individual road corridor/section is compiled in table 4.6.

#### Summary of Maintenance Cost of Existing Road Corridors/Sections

Road Corridor (Section for Rehabilitation)	Length (km)	Weighted Maintenance Cost Score	Total Score (20)	Transformed Score (20)
Shramthali-Thokarpa-Chehere (Shramthali-Attarpur)	39.8 (7.2)	17	20.0	20.0
Shramthali-Thokarpa-Chehere (Wafal-Chhere)	39.8 (19.5)	11	0.0	5.6
Talamarang-Bhotechour-Sankhu (Dhusenichaur-Bhotechaur)	27.7 (19.0)	14	10.0	10.0
Melchaur-Bhainse	11.0	13	6.7	6.7
Chautara-Syaule-Okhreni (Chautara-Syaule)	12.0 (6.0)	13	6.7	6.7
Chautara-Sipaghat	28.0	13	6.7	6.7

Source: Annex 4.6

Note: Figures in the parenthesis indicate section and length of existing roads proposed for rehabilitation

**TABLE 4.6**

The data analysis to determine the maintenance cost score point out that the road corridor/section that has minor difficulty in the road alignment, water management system, maintenance of existing structures, pavement type etc. requires the low maintenance cost and receives the high score. Therefore, **Shramthali-Attarpur** section of Shramthali-Thokarpa-Chehere road corridor receives the maximum score of 20.0 and ranked first. Likewise, **Dhusenichaur-Bhotechaur** section of Talarang-Bhotechau-Sankhu road corridor ranked second with the score of 10.0.

#### 4.7 Aggregation of Scores from Six Scoring Indicators for Rehabilitation

The total scoring of all indicators per road corridor/section proposed for rehabilitation is compiled in table 4.7. The rating of the individual indicators is explained in the respective chapters. The overall findings of the scoring exercise is that road where the seasonal traffic is being operated with the minimum maintenance measures, which requires low rehabilitation cost and has a higher export potentials receives a high priorities.

##### Summary of Overall Prioritisation of Existing Roads for Rehabilitation

Road Corridor (Section for Rehabilitation)	Length (km)	Parameters Used for the Prioritisation of Proposed Existing Roads for Rehabilitation							
		Demography (10)	Agricultural Exports (10)	Service/ Market Centres (10)	Traffic Volume (25)	Rehabilitation Cost (25)	Maintenance Cost (20)	Total Score (100)	Rank
Shramthali-Thokarpa-Chehere (Shramthali-Attarpur)	39.8 (7.2)	0.6	3.8	0.6	16.6	14.8	20.0	56.3	2
Shramthali-Thokarpa-Chehere (Wafal-Chhere)	39.8 (195)	0.6	3.8	0.6	4.4	16.4	5.6	31.4	6
Talarang-Bhotechour-Sankhu (Dhusenichaur-Bhotechaur)	27.7 (19.0)	10.0	5.4	1.0	25.0	25.0	10.0	76.4	1
Melchaur-Bhainse	11.0	0.6	8.9	0.0	2.0	18.9	6.7	37.1	5
Chautara-Syaule-Okhreni (Chautara-Syaule)	12.0 (6.0)	1.9	8.9	4.3	9.1	21.7	6.7	52.6	3
Chautara-Sipaghat	28.0	4.5	10.0	2.6	6.5	9.0	6.7	39.3	4

Source: Annex 4.7

Note: Figures in the parenthesis indicate section and length of existing roads proposed for rehabilitation

**TABLE 4.7**

The findings of the scoring system indicate that three road sections/corridors namely **Dhusenichaur-Bhotechaur**, **Shramthali-Attarpur** and **Chautara-Syaule** have top priorities for the rehabilitation. A comparison of findings among these roads indicates that scores are higher with respect to other roads. Their individual scores are 76.4, 56.3, and 52.6 respectively. Basically, the road sections/corridors where the traffic is regularly operating at the existing situation except in monsoon season requires less rehabilitation measures and maintenance cost and appeared in the top rankings in the prioritisation process. The scores of other low priority road sections/corridors are in the range of 31.4 to 39.3.

## 5. FUNDING SOURCES FOR THE DTMP IMPLEMENTATION

### 5.1 Potential Funding Sources

Details of the anticipated resources available for DTMP implementation are collected by the PSU from the districts, HMG and donors. Ongoing rural road/rural access programmes are also consulted with regard to future plans for expansion or curtailment. The most likely sources of funding are listed as follows:

- HMG/N
- DDC resources
- VDC resources
- National Road Board
- Donors

Following an investigation by PSU amongst potential funding agencies of the Sindhupalchowk DTMP implementation the following sources were identified:

#### a) DoLIDAR

Under the Agricultural Perspective Plan (1995/2015) DoLIDAR has allocated Rs 4.0 millions to the agricultural road sector during the FY 58/59. Based on past experience it can be assumed that this amount will increase by 15% in the average annually.

#### b) DoR/MoLD

DoR/MoLD provides a special grant for village and district road development to the district. According to the annual budget of HMG/N, DoR/MoLD had allocated total of Rs 7.0 million for 058/59 fiscal year. For the purpose of projecting the tentative budget for next four years, the average budget allocated for last seven years has been taken in the consideration. Based on the study of the past trend it is expected that the DoR/MoLD budget for district road construction and maintenance will likely to be increased by 15 % every year.

#### c) DDC

There are basically two sources of funding within the district.

- ◆ DDC block grants are coming into the district from MoLD for general development activities (development grant) and for the road sector (rural road grant). It is expected that Sindhupalchowk district will reserve 25 % of the total block grant including development and road sector grants for the district road activities. This will amount to Rs 3.4 million per year. It is not expected that the block grant will increase significantly over the years to come.
- ◆ DDC internal funds in Sindhupalchowk are mainly generated through taxes and royalties. Out of DDC's internal sources, Rs 1.4 million is expected to go into transport. An annual increase of 10 % is expected. Internal sources will be further increased by royalties from hydropower project, which is located within the district.

#### d) VDC

Each VDC receives a block grant of Rs 500,000 every year. Out of this total grant Rs 200,000 goes to internal human resources management. About 15 % of the remaining grant, which amounts to Rs 2.7 million, is expected to be used for district roads in VDCs through which the road passes. No increase in this contribution is expected.

**e) Constituency Development Fund**

At present each MP receives Rs. 1 million as a block grant for their constituency. Sindhupalchowk district has three constituencies and it is expected that about 10% of this grant will be allocated to the transport sector. This will amount to Rs 0.3 million per year.

**f) DRSP/SDC**

The budget allocated by the DRSP for the implementation of DTMP is about Rs.8.1 million in the current fiscal year 058/59. The tentative budget forecasted for the implementation phase is about Rs 7.7, 9.5 and 4.6 million for fiscal year 059/60, 060/61 and 061/62, and 062/63 respectively.

**g) Rural Community Infrastructure Works (RCIW)**

The RCIW programme under MoLD has been implemented in Sindhupalchowk district over the last four years. RCIW grant includes food-for-work and small cash component for purchasing construction materials. Discussions with RCIW authorities indicated that the budget of Rs 9.5 million has been allocated for FY 058/59. DRSP will provide technical assistance to RCIW to implement the construction programme from the next fiscal year 059/60 and RCIW will provide rice and cash component that amounts to 14.4 million for the next four years.

The district will have to identify and acquire other additional funding sources to finance the ambitious implementation of road construction and maintenance works, as identified in the District Transport Master Plan.

**5.2 Budget Forecast for DTMP Implementation**

Based on the above sources a tentative budget perspective can be made as shown in Table 5.1.

**Budget Forecast (Rs '000) for DTMP Implementation (058/59-062/63)**

Sources	058/59	059/60	060/61	061/62	062/63
DoLIDAR	4,000	4,600	5,290	6,084	6,996
DoR/MoLD	7,064	8,124	9,343	10,744	12,355
DDC block grant	3,367	3,367	3,367	3,367	3,367
DDC internal fund	1,395	1,535	1,688	1,857	2,043
VDC block grant	2,666	2,666	2,666	2,666	2,666
Constituency Devt. Fund	300	300	300	300	300
DRSP (SDC fund)	8,110	7,710	9,484	9,484	4,600
RCIW/MoLD	9,527	14,400	14,400	14,400	14,400
<b>Total</b>	<b>36,430</b>	<b>42,702</b>	<b>46,538</b>	<b>48,902</b>	<b>46,728</b>

**TABLE 5.1**

As mentioned in the previous section, with the present funding allocations to the district and the VDCs, not all plans can be realised. It is therefore of the utmost importance other sources of funding can be secured such as bilateral or multilateral donors for example the Asian Development Bank, World Bank etc.

In view of the limited resources the recommendation is to concentrate on roads under the DTMP, and to use funds that have already been secured on them.

### 5.3 Matching of Resources on High Ranked DTMP Roads

This Section describes the implementation plan of Sindhupalchowk DTMP roads and allocates the tentative budget (Table 5.1) to different components of the individual road corridors according to priorities given in Table 3.10 and 4.7. At this stage the estimated resources are matched with the highest ranked DTMP roads and roads that has been already initiated the construction works. Construction and rehabilitation costs are already estimated (refer to Section 3.7 and 4.5) so the number of highest ranked road links to be completed over the DTMP period is determined. DTMP 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 and central level with relevant HMG ministries and departments, 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. A number of construction, rehabilitation and maintenance activities have already been initiated. These activities are all initiatives in the framework of this DTMP and will be continued over the coming years. Following the priorities given to the individual corridors the physical and financial planning over the DTMP planning period 58/59 to 62/63 has been compiled in Table 5.2. It reflects allocated/committed funds for defined activities and eventual annual surpluses/deficits. Though the present forecast shows a huge deficit, the implementation plan has been prepared with provision of completing all high ranked (first sections) of DTMP roads. Eventually surplus/deficits will have to be deducted or added from allocated DTMP road budgets. The changes in the implementation plan will have to be sanctioned during the annual meetings of the Sindhupalchowk District Council.

#### Physical and Financial Plan for DTMP Roads

Roads by priority	Length (km)	Current year <sup>2</sup>	DTMP Implementation Year			
		058/59	059/60	060/61	061/62	062/63
<i>Likely available budget (Rs 000)</i>			<b>42,702</b>	<b>46,538</b>	<b>48,902</b>	<b>46,728</b>
<b>1. Attarpur-Wafal (Shramthali-Thokarpa-Chehere)</b>	13.1					
New Construction (Rs 000)			18,278	13,051		
Physical output (Km)			8.0	5.1		
Periodic Maintenance (Rs 000)				502	920	1,031
Routine Maintenance (Rs 000)				120	221	247
<i>Sub-total</i>			<b>18,278</b>	<b>13,673</b>	<b>1,141</b>	<b>1,278</b>
<b>2. Dhusenichaur-Bhotechaur</b>	19.0					
Rehabilitation (Rs 000)		3,520	1,792	1,204		
Physical output (Km)		11.0	5.0	3.0		
Periodic Maintenance (Rs 000)			616	1,004	1,335	1,495
Routine Maintenance (Rs 000)			148	241	320	359
<i>Sub-total</i>		<b>3,520</b>	<b>2,556</b>	<b>2,449</b>	<b>1,655</b>	<b>1,854</b>
<b>3. Chautara-Syaule (Chautara-Syaule-Okhrene)</b>	6.0					
Rehabilitation (Rs 000)			2,688			
Physical output (Km)			6.0			
Periodic Maintenance (Rs 000)				376	421	472
Routine Maintenance (Rs 000)				90	101	113
<i>Sub-total</i>			<b>2,688</b>	<b>467</b>	<b>523</b>	<b>585</b>

<sup>2</sup> Fiscal Year 2001/2002

Roads by priority	Length (km)	Current year <sup>2</sup>	DTMP Implementation Year			
			058/59	059/60	060/61	061/62
<b>4. Barhabise-Budhena</b>	8.5					
New Construction (Rs 000)			4,328	5,453		
Physical output (Km)			4.0	4.5		
Periodic Maintenance (Rs 000)				251	597	669
Routine Maintenance (Rs 000)				60	143	160
<i>Sub-total</i>			<b>4,328</b>	<b>5,764</b>	<b>740</b>	<b>829</b>
<b>5. Chautara-Sipaghat</b>	28.0					
Rehabilitation (Rs 000)			5,208	5,833	11,759	13,170
Physical output (Km)			5.0	5.0	9.0	9.0
Periodic Maintenance (Rs 000)				314	702	1,495
Routine Maintenance (Rs 000)				75	169	359
<i>Sub-total</i>			<b>5,208</b>	<b>6,222</b>	<b>12,630</b>	<b>15,024</b>
<b>6. Jalbire-Katike (Tembathan)</b>	13.7					
New Construction (Rs 000)			8,154	6,489	7,671	10,596
Physical output (Km)			4.0	3.0	3.0	3.7
Periodic Maintenance (Rs 000)				251	492	787
Routine Maintenance (Rs 000)				60	118	189
<i>Sub-total</i>			<b>8,154</b>	<b>7,160</b>	<b>8,281</b>	<b>11,572</b>
<b>7. Melchaur-Bhainse</b>	11.0					
Rehabilitation (Rs 000)				4,127	2,641	
Physical output (Km)				7.0	4.0	
Periodic Maintenance (Rs 000)					492	865
Routine Maintenance (Rs 000)					118	208
<i>Sub-total</i>				<b>4,127</b>	<b>3,251</b>	<b>1,073</b>
<b>8. Wafal-Chehere (Shramthali-Thokarpa-Chehere)</b>	19.5					
Rehabilitation (Rs 000)				3,989	3,723	4,170
Physical output (Km)				6.0	5.0	5.0
Periodic Maintenance (Rs 000)					421	865
Routine Maintenance (Rs 000)					101	208
<i>Sub-total</i>				<b>3,989</b>	<b>4,246</b>	<b>5,243</b>
<b>9. Melamchi-Bhotang</b>	20.5					
New Construction (Rs 000)					17,534	13,092
Physical output (Km)					6.0	4.0
Periodic Maintenance (Rs 000)						472
Routine Maintenance (Rs 000)						113
<i>Sub-total</i>					<b>17,534</b>	<b>13,677</b>
<b>Grand Total</b>			<b>41,212</b>	<b>43,850</b>	<b>50,000</b>	<b>51,135</b>
<i>Deficit (-) / Surplus (+)</i>			<b>(+)1,490</b>	<b>(+)4,178</b>	<b>(+)3,080</b>	<b>(-)1,327</b>

Note: 12 percent annual inflation rate is used while calculating the cost.

**TABLE 5.2**

During the preparation of this plan it is assumed that the construction of Attarpur-Wafal section of Shramthali-Thokarpa-Chehere corridor will be carried out under the "Expanded RCIW Programme" during the fiscal year 058/59 and onwards. Consequently the required resources will be provided by RCIW for this road while the remaining resources will be allocated for the construction and maintenance of other roads. Furthermore, it is expected that DoR will continue its contribution in the

construction of other road for the next five years. Similarly, DoLIDAR will also continue its contribution in the construction of other agriculture and district roads within the district.

During the course of DTMP implementation, if DDC gets additional funding, the remaining roads or road section of road under construction will be constructed based on priorities set out by the DTMP.

## 6. PREPARATION AND PRIORITISATION 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 Vol. I).

As outlined in step 17 (Figure 2.1) of the DTMP "Methodology" relevant sections of the draft DTMP along with a map which shows the proposed DTMP roads and existing village, district and strategic roads were distributed to each VDC representative (Chairman & Vice-chairman). Guidelines are also prepared and distributed to assist them in understanding the maps and the sections of draft DTMP, which have been distributed. The guidelines also give details of the procedures for suggesting modifications to the draft DTMP and for formulating proposals for DTPP roads.

After reaching mutual agreement between DRCC/DDC and PSU on preliminary DTMP, a meeting of all VDC Chairmen, Vice Chairmen and Ilaka Members was organised at the district headquarter for the orientation Workshop for the DTPP on May 2001.

### 6.1 Roads Recommended for DTPP

A one-day workshop was organised on 4 June 2001 for Chairman of VDCs and Ilaka members to present their proposals, harmonise and prioritise them for DTPP roads. The workshop proposed following roads (Table 6.1) for the District Transport Perspective Plan (DTPP) that has yet to be approved from District Council. Both DTMP and DTPP are expected to be approved from District Council that will be held (tentative schedule) on early February 2003. The roads proposed for DTPP are as follows:

#### Proposed DTPP roads

Road Reference No.	Road Corridor	Length (Km)	Remarks
23A026R	Talamarang-Bhotechau-Sankhu (Talamarang-Dhusenichaur)	8.7	A
23A043R	Chautara-Syaule-Okhreni (Syaule-Okhreni)	6.0	A
23A001R	Karkitar-Sukute	4.5	A
23A058A	Sikre-Thulodhading	14.0	A
23A003R	Jitpur(Chihane)-Jalkini	7.4	A
23A005R	Jalkini-Ikhu	4.8	A
23A007R	Jalkini-Jhyari Khola	7.2	A
23B009R	Pokhare-Jyamire(Sipapokhare)	15.9	A
23A010R	Bhimtar-Sipatar	23.2	A
23A012R	Jyamire-Kolgaira	3.8	A
23A015R	Chautara-Kotdanda	12.2	A
23A016R	Nawalpur-Melamchi	7.1	A
23A017R	Sipaghat(Bhimtar)-Tipeni	23.3	A
23A018R	Sipaghat-Chhap Bhanjyang	6.5	A
23A019R	Phatksila (Thulagau)-Majhitar	2.6	A
23B021R	Botechaur-Dhikurebesi	10.0	A
23A022R	Dhakal Khahare-Kattikechhap	6.0	A

Road Reference No.	Road Corridor	Length (Km)	Remarks
23B024R	Thakle-Talamarang	9.0	A
23B025R	Melamchi-Dhuseni	10.0	A
23A027R	Botechaur (Nibuwagau)-Sindhukot	5.1	A
23B028R	Jaisigaun-Kutumsang	22.6	A
23A029R	Pati Bhanjyang-Talamarang	8.9	A
23A031R	Manegaira-Mahankal	11.4	A
23B032R	Haldi-Kutumsang	19.7	A
23B033R	Sera-Hawadanda	8.6	A
23B034R	Melamchi-Sermathan	13.1	A
23A035R	Tipeni-Nigale Bhanjuang	10.8	A
23A036R	Hawadanda (Duwachaur)-Sunchaur	24.4	A
23A037R	Dhap-Bandan	12.4	A
23A040R	Okhrenei-Majhuwa	27.0	A
23A041R	Nawalpur (Kaijale)-Okhrenei	8.4	A
23A042R	Sanigauda-Baikunthe (Tarke)	15.2	A
23A043R	Surke(Syaule)-)Okhrenei	11.7	A
23A044R	Chautara-Jalbire	11.7	B
23A045R	Deurali (Kubhinde)-Chhap	6.2	B
23A047R	Katike-Tembathan	15.2	B
23A048R	Kothe-Bhairavkunda	57.2	B
23A049R	Khukuntol-Dugunagadhi	7.2	B
23A050R	Tyangthali-Marming-Yarmala	19.5	B
23A052R	Barhabise-Maneswara	5.7	B
23A053R	Barhabise-Budhepa-Kharidhunga	20.2	B
23A054R	Sunkoshi Dam-Tauthali-Jaljale	11.9	B
23B055R	Thulopakhar-Thumpakhar	11.8	B
23A057R	Thulodhading-Dolakha (Nigale)	10.2	B
23A060R	Sunkhani-Sindhunga	12.4	B
23A061R	Thumopakhar-Baghbhairav	13.7	B
23A062R	Bhainse-Aduwabari	10.1	B
23A063R	Aduwabari-Kerabari	3.5	B

A: High Priority

B: Others

**TABLE 5.1**

## **7. ORGANISATIONAL AND FINANCIAL ISSUES**

### **7.1 Relevant Institutions in the District**

During the initial workshop in September 1999 the DDC Sindhupalchowk formed the DRCC. The DRCC is an institutionalised advisory body to the DCC with regard to formulating, managing and monitoring district level road and trail policies, rules and regulations.

In December 1999 the district technical team has been formed within the DDC Technical Unit and 1 engineer and 2 overseers were hired by the DDC.

**As soon as construction activities will start LRCCs and UGs will be established.**

### **7.2 Budgetary Arrangements and Flow of Funds**

Following the agreement between Sindhupalchowk District, DoLIDAR and DRSP a District Road Fund (DRF) has been established. The DRF will be replenished by contributions from DoLIDAR, DDC block grant, DDC internal funds, VDC block grant, Constituency Development Fund, DoR/MoLD and DRSP. RCIW is another organisation under the Ministry of Local Development involved in district infrastructures development through Food for Work Programme in the district for the last two years

All activities related to the implementation of the DTMP will be financed through the DRF. Expenditure will be made based on approved cost estimates.

### **7.3 Road Construction, Operation and Maintenance**

The district, DRSP and the DDC of Sindhupalchowk have agreed to apply labour intensive and environment friendly methods throughout the implementation period of the DTMP. The district roads are to be constructed to fair weather standard using local human and material resources either through contractors and/or user groups. For the sake of consistency, it is strongly recommended to apply the same methods also on district roads that are implemented through other programmes.

The basic principle of DTMP implementation is to bring prior to new construction existing roads into maintainable condition. A concept of cyclic maintenance through length workers will be introduced. Local user groups will be responsible for management, coordination and supervision of maintenance work. In order to prevent early damages on the roads during rainy season district roads will be closed to heavy traffic and other traffic will be controlled. Wherever possible the poorest strata of the population and in particular women will be involved in the construction and maintenance process. The principles, concepts and implementation steps for construction and the maintenance are described in detail in the methodology (See Section 1.4, Volume I).

### **LIST OF MAPS**

- Map no. 1 Transport Infrastructure and Location of the District
- Map no. 2 Indicative Development Potential
- Map no. 3 District Road Inventory
- Map no. 4 Proposed DTMP Roads
- Map no. 5 Zone of Influence of DTMP Roads
- Map no. 6 Land Use
- Map no. 7 Existing Trade Flow
- Map no. 8 DTMP Roads for
- Map no. 9 DTMP and DTPP Roads

### **Attachment**

Transport Infrastructure Map 1: 125,000; District Transport Plan, Sindhupalchowk District