



Government of Nepal



District Transport Master Plan (DTMP)

Ministry of Federal Affairs
and Local Development

Department of Local
Infrastructure Development and
Agricultural Roads (DoLIDAR)
District Development Committee,
Mustang



July 2013

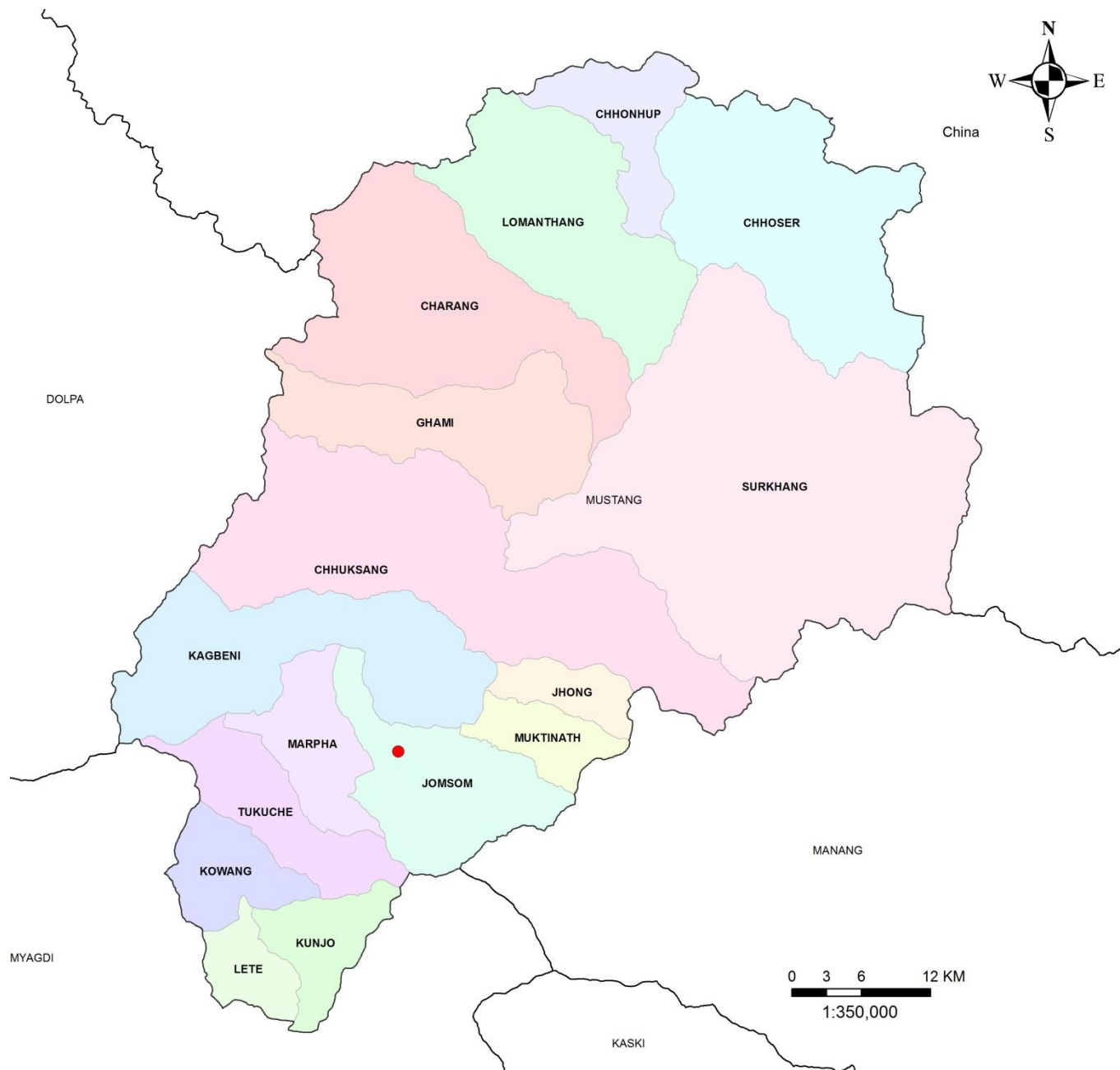
Vol I: Main Report



Submitted by GOEC Nepal Pvt. Ltd. for the District Development Committee (DDC) and District Technical Office (DTO), for Mustang with Technical Assistance from the Department of Local Infrastructure and Agricultural Roads (DoLIDAR), Ministry of Federal Affairs and Local Development and grant supported by DFID.

DISTRICT TRANSPORT MASTER PLAN

MUSTANG DISTRICT



2013



Government of Nepal
Ministry of Federal Affairs and Local Development

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FOREWORD

It is my great pleasure to introduce this revised District Transport Master Plan (DTMP) of Mustang district which was concurred by the district stakeholder's meeting held on 31 March 2013, passed by DDC Board Meeting of 31 March 2013 and approved by the DDC Council on 28 May 2013. Based on the DTMP Guideline 2012, all together 4 District Road Core Network (DRCN) aiming to connect all Village Development Committee (VDC) headquarters with the district headquarter, either directly or through strategic road network (SRN) have been selected. By bringing the DRCN to a maintainable and all-weather standard, year-round access to all VDCs headquarters can be ensured.

I believe this document will be helpful to materialize Rural Transport Infrastructure Sector Wide Approach (RTI-SWAP) through sustainable planning, resources mobilization, implementation and monitoring of the road development. The document is anticipated to generate substantial employment opportunities for rural people through conversation, improvement and new construction activities of the existing road network. DRCN plays an important role to strengthen and promote overall economic growth of the district through established and improved year round transport services reinforcing intra and inter-district linkages. It is most crucial to expand DRCN in a planned way as per the DTMP recommendations by considering the framework of available resources in DDC. This document is very essential in lobbying the donor agencies through central government to attract fund gap. Furthermore, this document will be supportive in avoiding prevailing duplication in resources allocation in road network development by considering basket fund approach.

I would, firstly like to express my gratitude to RTI Sector Maintenance Pilot for financial and technical support. Secondly, my thanks go to Mr Hum Nath Sharma Dhakal, Under Secretary (DDC), Er. Chandra Prakash Subedi, District Engineer (DTO), Er. Sakal Deo Sharma, Engineer (DDC), Mr Kedar Singh Thapa, Information and Communication Officer (DDC) and other DDC/DTO Staff for their valuable efforts in the process of producing this document. My special thank goes to all the representatives of political parties, who played crucial role in providing constructive feedbacks and valuable support in preparing this document successfully.

Last but not least, I would like to express my heartfelt gratitude to Ministry of Federal Affairs and Local Development (MoFALD) and Department of Local Infrastructure Development and Agriculture Road (DOLIDAR/MoFALD) for providing valuable suggestions and cooperation to produce this report. Any pioneering and constructive suggestions regarding this document will be highly appreciated.

D. R. Sigdel

Dilli Ram Sigdel

Local Development Officer



PREFACE / ACKNOWLEDGEMENTS

This DTMP Report for Mustang District has been prepared on the basis of 2012 *DTMP New Guidelines* prepared by the RTI-SWAp team in close coordination with DOLIDAR.

The job was entrusted to the GOEC Nepal Pvt. Ltd. This report is prepared at the final stage of the study as Final Report.

The consultants' would like to express its appreciation to the officials from RTI-SWAp team and DOLIDAR. The RTI SWAp Team Leader Mr Michael Green, Deputy Team Leader – Mr Dilli Sitaula, Co-coordinator SDE – Mr Ganga Bahadur Basnet, SDEs- Mr Manoj Krishna Shrestha and Mr Jeewan Guragain, Contracts Officer- Mr Ramesh Lal Shrestha of DoLIDAR are highly grateful for the support.

Last but not the least we are very grateful with the LDO- Mustang, Mr Dilli Ram Sigdel, DTO- Mr Chandra Prakash Subedi and other staffs of Mustang DDC and other local peoples of Mustang, who directly and indirectly contribute during this study and field survey.

Finally, the project team would like to express thanks to all staffs and colleagues of GOEC Nepal Pvt Ltd for their anxious support for this study.

Prof. Dr. Padma Bahadur Shahi
Project Director

EXECUTIVE SUMMARY

Mustang district is located in Dhaulagiri zone of the Western Development Region of Nepal. It is border with Tibet to the North, Manang to the East, Myagdi to the South and Dolpa to the West. The district has 16 VDCs, 9 Ilakas and 1 constituency area, The total area of the district is 3573 sq. km. The district lies in Mid-Hills. The lowest elevation point is 1372 m and the highest elevation point is 8167 m from the mean sea level. As a result of the elevation differences, the district has two different types of climate: sub-tropical from 1000-2000 m and temperate above 2000 m. The annual rainfall is about 184 mm and temperature vary from -9°C to 26°C. The tourism and herbs are the main source of occupation and livelihood of the majority of the population.

The district inventory identified just over 250 km of roads, including 151 km of strategic roads and 107 km of rural roads. In coordination with the DTICC and DDC, 4 rural roads with a length of 27 km were identified as making up the district road core network (DRCN), and the remaining 80 km were classified as village roads. The existing DRCN roads link up 16 of the 16 VDC headquarters. All of the DRCN roads are earthen fair-weather roads.

Road Class	Total length	Black Top	Gravel	Earthen
Strategic road network	151.00	-	-	151.00
District road core network	27.34	-	-	27.34
Village roads	79.51	-	-	79.51
Total	257.85	-	-	257.85

Annual conservation costs are estimated at NPR 8.2 million based on the first year, and will be updated in the ARMP based on actual annual maintenance needs as determined in the annual road condition survey. For the full five-year period the conservation costs will come to NPR 41 million. An analysis of the road network identified the need for improvement of all the DRCN roads in order to bring them to a maintainable all-weather standard and provide them with a proper road surface in light of existing traffic volumes. The required improvements and their estimated costs are listed below.

Sn	Improvement type	Requirement		Cost (NPR)
1	Bridges	540	m	367,740,000
2	Slab culverts	12	m	2,040,000
3	Causeways	6	m	690,000
4	Hume pipes	0	units	-
5	Masonry retaining walls	0	m ³	-
6	Gabion retaining walls	1380	m ³	6,292,800
7	Lined drains	7500	m	18,750,000
8	Widening	760	m	18,240,000
9	Rehabilitation	0	km	-
10	Gravelling	27.34	km	73,818,000
11	Blacktopping	0	km	-
12	New construction	-	km	-
	Total			487,570,800

The available budget for the road sector for the coming five years (fiscal year 2070/71 to 2074/75) is estimated to be NPR 635.2 million. Allocation to the district road core network was set at 80% of the total road sector budget, which was subsequently allocated firstly to the annual maintenance needs, secondly to the improvement needs and lastly to new construction. This budget is insufficient to cover all the estimated costs of conservation, improvement and new construction. However, it allows all conservation requirements to be

covered throughout the DTMP period and almost all improvement works to be completed before the end of the DTMP period. The remaining improvement works will be carried out in the next DTMP. New construction is not possible within this DTMP period and will also be carried out under the next DTMP.

Within the DTMP period 25.87 km of roads will be gravelled (95%) and brought to a maintainable all-weather standard. VDC headquarters with access to all-weather DRCN roads or the SRN will increase from 12 to 15, while the percentage of the district population with such access will increase from 82% to 98%.

ABBREVIATIONS

DDC	District Development Committee
DOLIDAR	Department of Local Infrastructure Development and Agriculture Road
DOR	Department of Road
DTICC	District Transport Infrastructure Coordination Committee
DTMP	District Transport Master Plan
DTPP	District Transport Perspective Plan
GIS	Geographical Information system
GPS	Global Positioning System
GON	Government of Nepal
LGCDP	Local Governance and Community Development Programme
MFALD	Ministry of Federal Affairs and Local Development
SWAp	Sector Wide Approach
VDC	Village Development Committee

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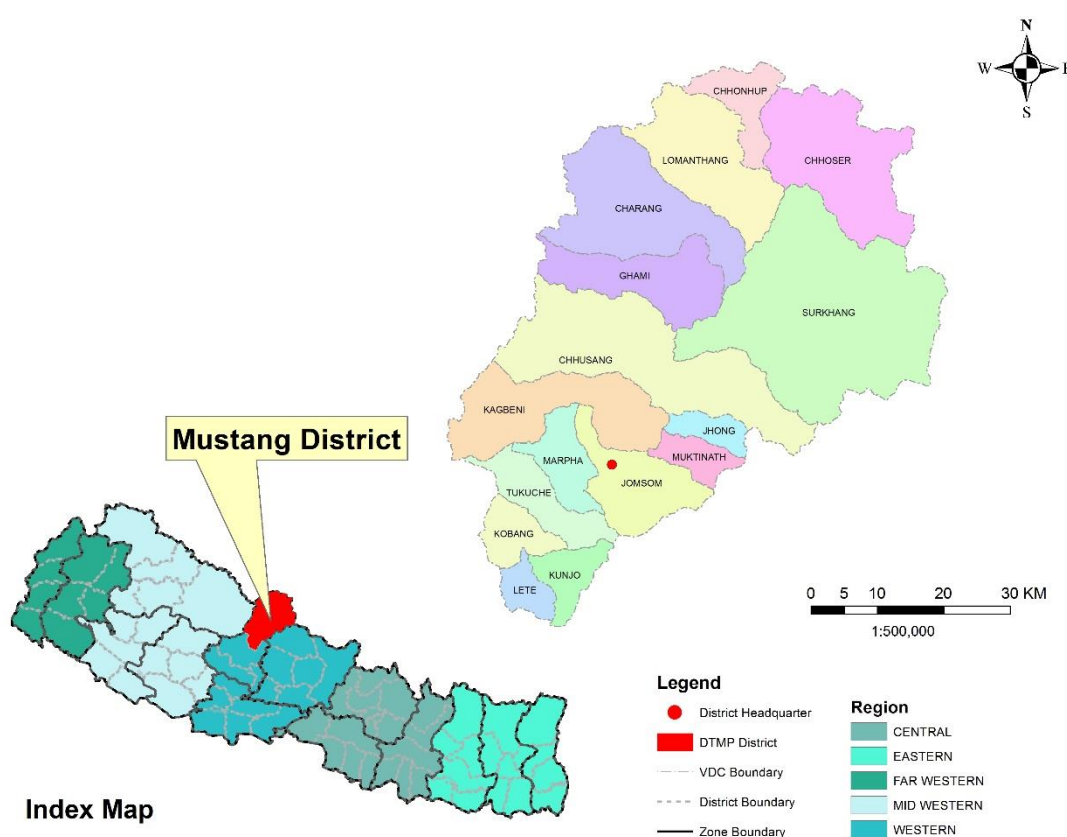
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1. INTRODUCTION

Mustang district is located in Dhaulagiri zone of the Western Development Region of Nepal. It is border with Tibet to the North, Manang to the East, Myagdi to the South and Dolpa to the West. The district has 16 VDCs, 9 Ilakas and 1 constituency area, The total area of the district is 3573 sq. km. The district lies in Mid-Hills. The lowest elevation point is 1372 m and the highest elevation point is 8167 m from the mean sea level. As a result of the elevation differences, the district has two different types of climate: sub-tropical from 1000-2000 m and temperate above 2000 m. The annual rainfall is about 184 mm and temperature vary from -9°C to 26°C. The tourism and herbs are the main source of occupation and livelihood of the majority of the population.

Figure 1 Location of the district



According to the National Census 2011, the total population of the district is 13,452 comprising 6,359 female (48.27%) and 7,093 male (52.73%) residing in 3,354 households. Mustang district has an average population density of around 3.76 people per sq. km. The average family size is 5. Life expectancy of the people is 52 years. The average literacy rate is about 66.2%. Mustang district has a multi ethnic composition with Gurung Thakali, Magar, Thakuri and other. The common language is Nepali (70.3%) followed by Magar (3.1%), Thakali (24.5%) and other (2.1%).

The Pairothapla-Jomsom-Ghoktang (F042) road connects the district headquarter of Jomsom with neighboring strategic road networks and straightly connects with China Border and Kagbeni – Muktinath (F166) road give access to Muktinath, the religious place of Nepal.

2. DISTRICT ROAD CORE NETWORK (DRCN)

This chapter gives an overview of the existing roads in Mustang District, distinguishing between strategic roads and rural roads. It goes on to identify those rural roads that make up the district road core network (DRCN) that will form the basis for this DTMP. The remaining rural roads are classified as village roads

2.1 TOTAL ROAD NETWORK

Mustang district has an estimated road network of 258 kilometres, including 151 kilometres of strategic roads managed by DOR and 107 kilometres of rural roads managed by Mustang DDC and the VDCs. All the strategic roads and all of the rural roads have an earthen surface. A map of the total road network in Mustang district is shown in Figure 2 at the end of this chapter.

Table 2.1.1 Total road length (km)

Road Class	Total length	Black Top	Gravel	Earthen
Strategic roads	151.00	-	-	151.00
Urban roads	-	-	-	-
Rural roads	106.85			106.85
Total	257.85	-	-	257.85

2.2 NATIONAL HIGHWAYS AND FEEDER ROADS

Mustang district has only 2 Feeder Road (Pairothapla-Jomsom-Ghoktang Road and Kagbeni - Muktinath Road) totaling just over 150 km. These roads are all earthen managed by Divisional Road Office of the Department of Roads in Pokhara.

Table 2.2.1 National Highways and Feeder Roads (km)

Code	Description	Total length	Black Top	Gravel	Earthen
F042	Pairothapla-Jomsom	37.00	-	-	37.00
F042	Jomsom-Ghoktang	102.00	-	-	102.00
F166	Kagbeni-Muktinath	12.00	-	-	12.00
Total		151.00	0.00	0.00	151.00

2.3 DISTRICT ROAD CORE NETWORK

As part of the preparation of this DTMP, the District Road Core Network (DRCN) was identified together with the DTICC and DDC. This DRCN is the minimum network that allows all VDC headquarters to be connected with the strategic road network and the district headquarters, either directly or through other VDCs. In the selection of the DRCN roads, account was taken of the road conditions and the existing traffic levels. The identified DRCN roads were subsequently provided with road codes according to national standards.

The resulting District Road Core Network in Mustang district is shown in Figure 3 at the end of this chapter. The DRCN consists of 4 district roads with a total length of 27.34 km and most of the VDC headquarter found to be linked with Strategic road network. The remaining 79.51 km of existing rural roads are not considered to be DRCN roads and are classified as village roads under the responsibility of the VDCs (see also section 2.3). All DRCN roads are currently earthen roads and are considered fair-weather only (see Table 2.3.1). A complete list of the DRCN roads and their characteristics is provided in

Table 2.3.2

Table 2.3.1 Total road length (km)

Road Class	Total length	Black Top	Gravel	Earthen
Strategic road network	151.00	-	-	151.00
Highways	-			
Feeder roads	151.00			151.00
Urban roads	-	-	-	-
District road core network	27.34	-	-	27.34
Village roads	79.51	-	-	79.51
Total	257.85	-	-	257.85

Table 2.3.2 District road core network (km)

Code	Description	Total length	Black Top	Gravel	Earthen	All weather	Fair weather
42DR001	F042- Kunjo VDC Center Road	3.93			3.93	-	3.93
42DR002	F042- Jhong Road	9.16			9.16	-	9.16
*42DR003	F042- Dhye khola- Dhi Gaun Road	10.24			10.24	-	10.24
42DR004	F042-Thinger Chhonhup Road	4.01			4.01	-	4.01
Total		27.34	-	-	27.34	-	27.34

2.4 VILLAGE ROADS

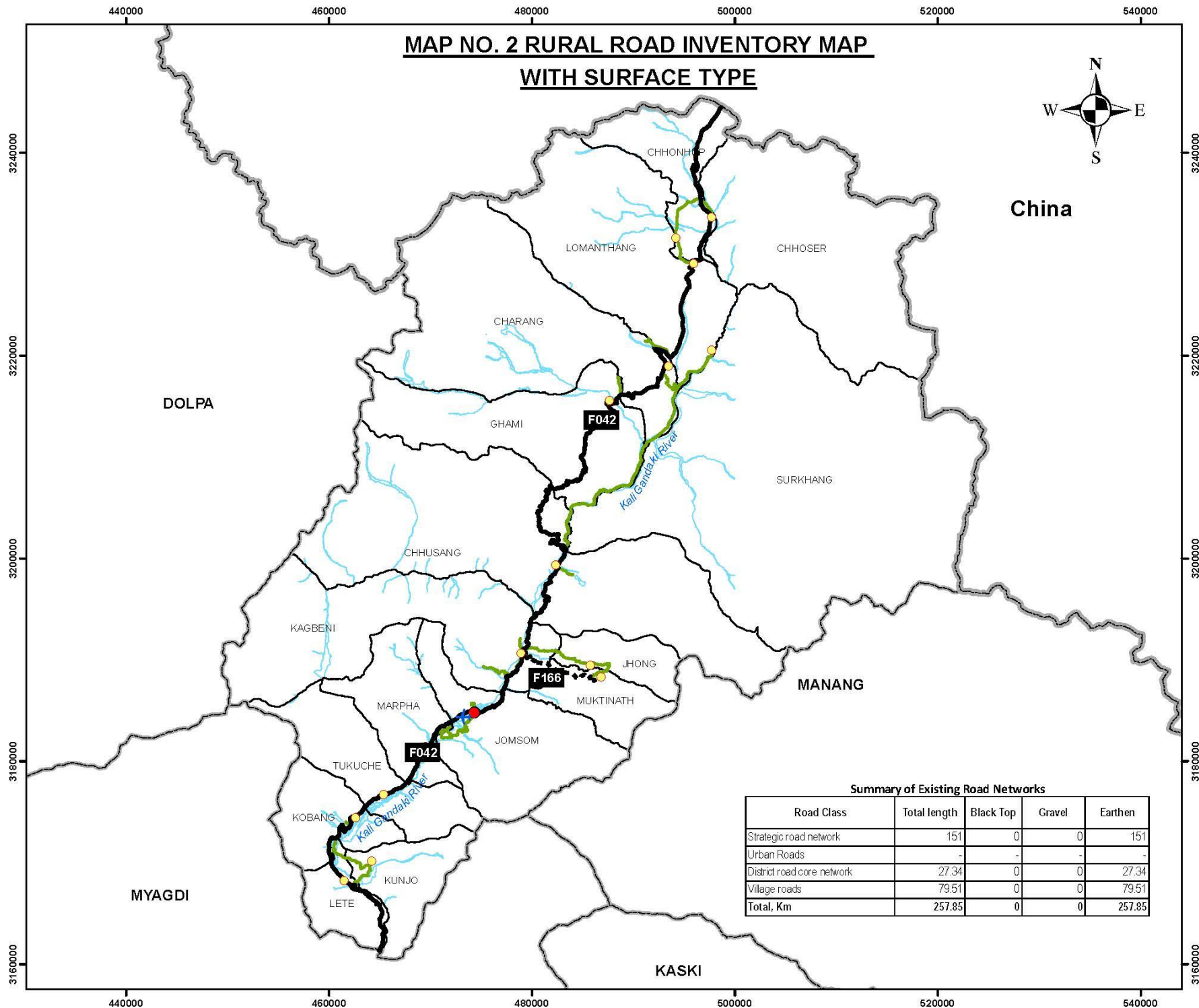
The 79.51 km of remaining roads that do not form part of the identified district road core network (DRCN) are classified as village roads and are under the responsibility of the 16 VDCs in Mustang District. These are roads of a lower importance that do not form the main link between the VDC headquarters and the district headquarters or strategic road network. Instead they provide additional access to other parts of the VDCs.

On average each VDC will thus be responsible for 5 km of village roads. It is recommended that the VDCs organise maintenance workers to carry out the emergency and routine/recurrent maintenance of these roads to ensure they remain accessible. Any upgrading or new construction of village roads falls outside the scope of this DTMP and is the responsibility of the VDCs.

Funding for these roads will mainly come from the VDC grants. Some district funding will also be allocated to the village roads. However, this district funding will be mainly for maintenance, especially emergency maintenance and routine/recurrent maintenance to keep the village roads open.

* This district road has been found as fair weather road which passes through settlement Surkhang and forward towards Yara and Ghara. For alternative connection (42DR003) to Surkhang VDC headquarter, new construction from Charang may be feasible, passing with less number of water crossing.

MAP NO. 2 RURAL ROAD INVENTORY MAP WITH SURFACE TYPE



Legend

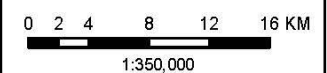
- Airport (Jomsom)
- District Headquarter
- VDC Centre
- Rural Road (Earthen)
- SRN Earthen Road
- SRN Plan Road
- VDC Boundary
- District Boundary
- International Boundary
- River

Name of District	District Development Committee, Mustang
Project	Preparation of District Transport Master Plan
Technical Assistance	MoFALD, DoLIDAR, RTI Sector Maintenance Pilot (SWAP)
Grant Supported By	Department For International Development (DFID)
Consultant	GOEC Nepal Pvt. Ltd., Buddhanagar, Kathmandu
Source	Department of Survey

Projected Co-ordinate System

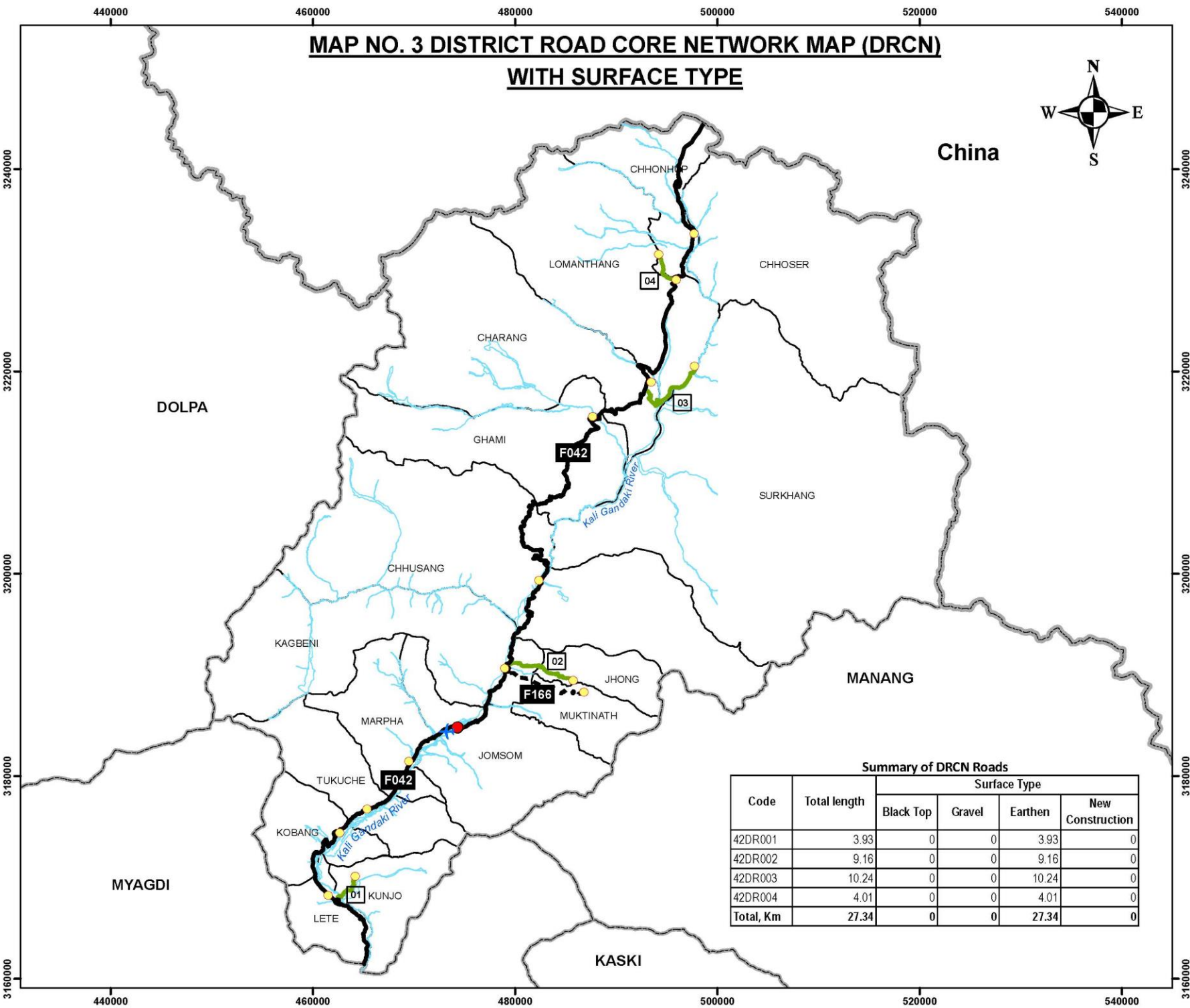
Projection	MUTM
False Easting	500000 m
False Northing	0 m
Central Meridian	84
Spheroid	Everest 1830

Scale Information




Summary of Existing Road Networks

Road Class	Total length	Black Top	Gravel	Earthen
Strategic road network	151	0	0	151
Urban Roads	-	-	-	-
District road core network	27.34	0	0	27.34
Village roads	79.51	0	0	79.51
Total, Km	257.85	0	0	257.85



Name of District	 District Development Committee, Mustang
Project	Preparation of District Transport Master Plan
Technical Assistance	MoFALD, DoLIDAR, RTI Sector Maintenance Pilot (SWAP)
Grant Supported By	Department For International Development (DFID)
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Projected Co-ordinate System	
Projection	MUTM
False Easting	500000 m
False Northing	0 m
Central Meridian	84
Spheroid	Everest 1830

Scale Information	
	
1:350,000	

3. DISTRICT TRANSPORT PERSPECTIVE PLAN (DTPP)

This chapter looks at the required interventions regarding conservation, improvement and new construction of the district road core network. It provides a complete list of all works required in the DRCN, which together form the District Transport Perspective Plan (DTPP). For the works forming part of the DTPP, chapter 4 will subsequently provide cost estimation, while chapter 5 will rank the works according to priority and chapter 6 will select those priority works that can be carried out in the next 5 years and thus form part of the District Transport Master Plan (DTMP).

3.1 CONSERVATION

Conservation refers to the actions required to repair a road and keep it in good and passable condition. For DTMP planning purposes standard costs per kilometre for each maintenance type are applied to the entire district road core network, whereby for certain maintenance type's distinction is made according to the surface type of the road. Identification of the actual maintenance requirements of each road is made annually in the ARMP. Conservation activities include:

1. Emergency maintenance - Basic repairs aimed at removing landslides and repairing damage to the road that inhibit the proper use of the road and make it impassable. This mainly takes place during and after the rainy season. A provisional lump sum is reserved for the entire district road core network based on the network length. Allocation to specific road sections is based on the actual need for clearing landslides or repairing washouts and cuts in the road.
2. Routine maintenance - General maintenance of the road aimed at preventing damage by ensuring the proper working of the different road elements (retaining walls, drainage system, carriageway, etc.) and cutting vegetation. This is carried out each year on a more or less continuous basis. Routine maintenance is required for the entire district road core network. The specific requirements for routine maintenance are determined on an annual basis through the road condition survey and defined in the ARMP.
3. Recurrent maintenance - Repairs of minor damage to the road surface and road structures to bring them back to good condition. This is generally carried out once or twice a year. Recurrent maintenance is required for the entire district road core network, whereby distinction is made according to the surface type. The specific requirements for recurrent maintenance are determined on an annual basis through the road condition survey and defined in the ARMP.
4. Periodic maintenance - Larger repairs to the road largely aimed at renewing the road surface through re-gravelling, resealing or overlays. It is generally carried out with several years interval. Although periodic maintenance is only required for specific sections of the district road core network, a lump sum allocation is made for the entire district road core network based on average annual requirements, distinguishing between different surface types. The specific periodic maintenance requirements are determined on an annual basis through the annual road condition survey and defined in the ARMP.

The length of roads to be included under each conservation type for the first year is indicated below. This is basically the entire district road core network in as far as it does not require rehabilitation.

Table 3.1.1 Conservation requirements

Code	Emergency maintenance (km)	Routine maintenance (km)	Recurrent maintenance (km)	Periodic maintenance (km)
42DR001	3.93	3.93	3.93	3.93
42DR002	9.16	9.16	9.16	9.16
42DR003	10.24	10.24	10.24	10.24
42DR004	4.01	4.01	4.01	4.01
Total	27.34	27.34	27.34	27.34

3.2 IMPROVEMENT

Improvement refers to actions required to improve a road to bring it to a maintainable all-weather standard. It includes the following actions, which for Mustang are described in more detail in the subsequent sections.

1. Rehabilitation - Significant repairs required to bring a very poor road back to a maintainable standard. This does not include any changes to the original surface type.
2. Gravelling - Placement of a gravel layer to make it all-weather and ensure that the road remains passable during the rainy season.
3. Cross drainage - Placement of suitable cross-drainage structures with the aim of making the road all-weather and ensuring that the road remains passable even during the rainy season
4. Protective structures - Placement of retaining walls and lined side drains to avoid excessive damage to the road during the rainy season and bring it to a maintainable standard.
5. Blacktopping - Placement of a blacktop layer in roads with traffic volumes exceeding 50 passenger car units (PCU) to reduce damage to the road surface
6. Widening - Increase of the road width in roads with traffic volumes exceeding 500 passenger car units (PCU) to ensure the proper flow of traffic.

3.2.1 REHABILITATION

No rehabilitation needs were identified in the district road core network.

Table 3.2.1 Sections of the district road core network requiring rehabilitation

Code	Description	Total length (km)	Gravelling (km)
Total		0.00	0.00

3.2.2 GRAVELLING

As the entire district road core network needs to be brought to an all-weather status, gravelling of the road surface is required for all the earthen sections in the DRCN. For Mustang this concerns the total of 27.34 km of DRCN roads.

Table 3.2.2 Sections of the district road core network requiring gravelling

Code	Description	Total length (km)	Gravelling (km)
42DR001	F042- Kunjo VDC Center Road	3.93	3.93
42DR002	F042- Jhong Road	9.16	9.16
42DR003	F042- Dhye khola- Dhi Gaun Road	10.24	10.24
42DR004	F042-Thinger Chhonhup Road	4.01	4.01
Total			27.34

3.2.3 CROSS DRAINAGE

The need for cross drainage was identified for the different DRCN roads. The total length of 540 m bridge, total length of 12 m slab culvert and 6 m total length of cement concrete causeway were identified as being required.

Table 3.2.3 Required cross drainage structures

Code	Description	Bridge (m)	Slab culvert (m)	CC Causeway (m)	Stone Causeway (m)	Pipe culvert (units)
42DR001	F042- Kunjo VDC Center Road	80				
42DR002	F042- Jhong Road			6		
42DR003	F042- Dhye khola- Dhi Gaun Road	460				
42DR004	F042-Thinger Chhonhup Road		12			
Total		540	12	6		

3.2.4 PROTECTIVE STRUCTURES

Based on the road survey carried out in Mustang, the following retaining walls were identified as being required to ensure the protection of the district road core network.

Table 3.2.4 Required protective structures

Code	Description	Masonry walls (m ³)	Gabion walls (m ³)	Lined drain (m)
42DR001	F042- Kunjo VDC Center Road		620	2,000
42DR002	F042- Jhong Road		320	2,500
42DR003	F042- Dhye khola- Dhi Gaun Road		350	1,000
42DR004	F042-Thinger Chhonhup Road		90	2,000
Total			1,380	7,500

3.2.5 WIDENING

Widening of the district road core network in Mustang is required only in specific locations to bring it up to the minimum standard and to ensure sufficient space in the curves. Additional widening to a higher standard is not required because traffic volumes remain very low.

Table 3.2.5 Sections of the district road core network requiring widening

Code	Description	Total length (km)	Widening (m)
42DR001	F042- Kunjo VDC Center Road	3.93	320
42DR002	F042- Jhong Road	9.16	160
42DR003	F042- Dhye khola- Dhi Gaun Road	10.24	240
42DR004	F042-Thinger Chhonhup Road	4.01	40
Total			760

3.2.6 BLACKTOPPING

An analysis of the traffic data for the different roads making up the district road core network (see 0) shows that there is no roads that are eligible for blacktopping (traffic volume exceeds 50 PCU). The blacktopping of these roads will be treated as a second phase of improvement after they have been gravelled.

Table 3.2.6 Sections of the district road core network requiring blacktopping

Code	Description	Total length (km)	Blacktop (km)	Traffic (VPD)	Blacktopping (km)
Total					

3.3 NEW CONSTRUCTION

New construction of DRCN roads is not required to connect the VDC headquarters. As all the existing road provide access to the VDC headquarters in Mustang.

Table 3.3.1 Sections of the district road core network requiring new construction

Code	Description	New VDCs	Existing length	New length	Bridge (m)
Total					

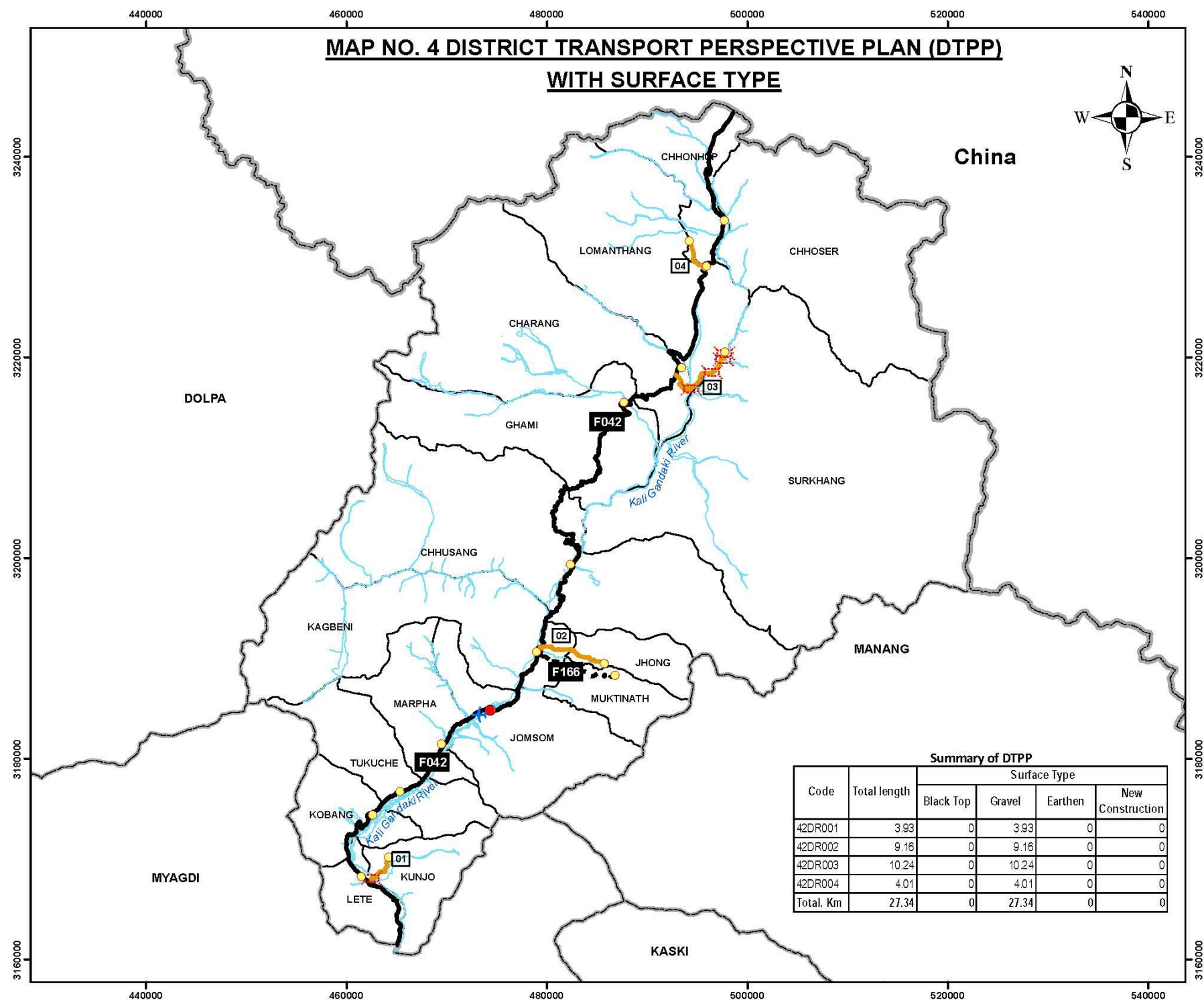
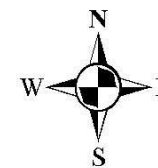
3.4 DISTRICT TRANSPORT PERSPECTIVE PLAN

The DTPP foresees bringing the entire existing district road core network to maintainable all-weather status to provide access to the VDC headquarters. For this purpose, all 27.34 km will be gravelled and a number of different cross drainage and protective structures will be constructed. No further new road is constructed and all existing DRCN road is maintained to all-weather gravel standard providing access to VDC HQs. The district road core network will subsequently consist of 27.34 km of maintainable all-weather roads. The following table lists the required interventions, while the proposed network is shown in the DTPP map in figure 4.

Table 3.4.1 District Transport Perspective Plan

Code	Emergency maintenance (km)	Routine maintenance (km)	Recurrent maintenance (km)	Periodic maintenance (km)	Rehabilitation (km)	Gravelling (km)	Blacktopping (km)	Widening (m)	Bridge (m)	Slab culvert (m)	CC Causeway (m)	Stone Causeway (m)	Pipe culvert (units)	Masonry walls (m3)	Gabion walls (m3)	Lined drain (m)	New construction (km)
42DR001	3.93	3.93	3.93	3.93	-	3.93	-	320.00	80.00	-	-	-	-	-	620.00	2,000.00	-
42DR002	9.16	9.16	9.16	9.16	-	9.16	-	160.00	-	-	6.00	-	-	-	320.00	2,500.00	-
42DR003	10.24	10.24	10.24	10.24	-	10.24	-	240.00	460.00	-	-	-	-	-	350.00	1,000.00	-
42DR004	4.01	4.01	4.01	4.01	-	4.01	-	40.00	-	12.0	-	-	-	-	90.00	2,000.00	-
Total	27.34	27.34	27.34	27.34	-	27.34	-	760.00	540.00	12.0	6.00	-	-	-	1,380.00	7,500.00	-

MAP NO. 4 DISTRICT TRANSPORT PERSPECTIVE PLAN (DTPP) **WITH SURFACE TYPE**



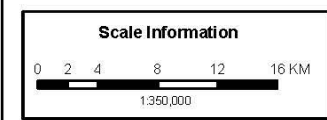
Legend

- Airport (Jomsom)
- District Headquarter
- VDC Centre
- Proposed Bridge
- SRN Earthen Road
- SRN Plan Road
- Rural Road (Gravel)
- VDC Boundary
- District Boundary
- International Boundary
- River

Name of District	District Development Committee, Mustang
Project	Preparation of District Transport Master Plan
Technical Assistance	MoFALD, DoLIDAR, RTI Sector Maintenance Pilot (SWAP)
Grant Supported By	Department For International Development (DFID)
Consultant	GOEC Nepal Pvt Ltd., Buddhanagar, Kathmandu
Source	Department of Survey

Summary of DTPP					
Code	Total length	Surface Type			
		Black Top	Gravel	Earthen	New Construction
42DR001	3.93	0	3.93	0	0
42DR002	9.16	0	9.16	0	0
42DR003	10.24	0	10.24	0	0
42DR004	4.01	0	4.01	0	0
Total, Km	27.34	0	27.34	0	0

Projected Co-ordinate System	
Projection	MUTM
False Easting	500000 m
False Northing	0 m
Central Meridian	84
Spheroid	Everest 1830



4. COST ESTIMATION

For the cost estimation, use has been made of standard costs for the different activities required. For the conservation activities this results in an estimation of annual costs, while for improvement and new construction activities this result in an estimation of the total costs required.

4.1 CONSERVATION

The costs of the required conservation measures have been calculated using the following standard costs. These standard costs have been applied to the entire district road core network, whereby distinction is made based on the surface type in the case of recurrent and periodic maintenance. It must be noted here that the standard costs for periodic maintenance are the average annual costs, but that the cost for applying periodic maintenance in a specific section every several years will be higher (the cumulative cost of several years). The estimated costs for the first year are presented below, while the costs for subsequent years will vary slightly as road surface types change as a result of improvements. Detailed cost estimations for the actual maintenance needs in any given year will be presented in the ARMP.

Table 4.1.1 Standard unit costs for conservation

Activity	Unit	Unit cost (NPR/km)
Emergency maintenance	km	30,000
Routine maintenance	km	20,000
Recurrent maintenance (blacktop)	km	500,000
Recurrent maintenance (gravel)	km	400,000
Recurrent maintenance (earthen)	km	250,000
Periodic maintenance (blacktop)	km	200,000
Periodic maintenance (gravel)	km	250,000

For the first year the estimated costs for conservation of the DRCN come to NPR 8.2 million. Based on this cost for the first year, the costs for conservation of the DRCN for the next 5 years are estimated at NPR 41 million. These costs will change slightly as the roads are improved and the standard conservation costs change. This will be updated in the ARMP on an annual basis.

Table 4.1.2 Estimated conservation costs for the first year (NPR '000)

Code	Total length (km)	Blacktop (km)	Gravel (km)	Earthen (km)	Emergency	Routine	Recurrent (blacktop)	Recurrent (gravel)	Recurrent (earthen)	Periodic (blacktop)	Periodic (gravel)	Total annual cost	Total 5-year cost
42DR001	3.93	-	-	3.93	118	79	-	-	983	-	-	1,179	5,895
42DR002	9.16	-	-	9.16	275	183	-	-	2,290	-	-	2,748	13,740
42DR003	10.24	-	-	10.24	307	205	-	-	2,560	-	-	3,072	15,360
42DR004	4.01	-	-	4.01	120	80	-	-	1,003	-	-	1,203	6,015
Total	27.34	-	-	27.34	820	547	-	-	6,835	-	-	8,202	41,010

4.2 IMPROVEMENT

The costs of the required improvement measures have been calculated using the following standard costs. These standard costs have been applied to the identified improvement requirements presented in the previous chapter.

Table 4.2.1 Standard unit costs for improvement activities

Activity	Unit	Unit cost (NPR)
Rehabilitation	km	800,000
Widening	m	24,000

Activity	Unit	Unit cost (NPR)
Gravelling	km	2,700,000
Blacktopping	km	5,700,000
Bridge construction	m	681,000
Slab culvert construction	m	170,000
CC Causeway construction	m	115,000
Stone Causeway construction	m	10,000
Pipe culvert placement	unit	25,000
Masonry wall construction	cu.m	10,000
Gabion wall construction	cu.m	4,560
Lined drain construction	m	2,500

The resulting estimated costs come to NPR 487.6 million as indicated in the table below.

Table 4.2.2 Cost estimate for improvement measures (NPR '000)

Code	Total length (km)	Widening	Gravelling	Bridges	Slab Culverts	CC Causeway	Stone causeways	Pipe culvert	Masonry walls	Gabion walls	Lined drains	Total cost
42DR001	3.93	7,680	10,611	54,480	-	-	-	-	-	2,827	5,000	80,598
42DR002	9.16	3,840	24,732	-	-	690	-	-	-	1,459	6,250	36,971
42DR003	10.24	5,760	27,648	313,260	-	-	-	-	-	1,596	2,500	350,764
42DR004	4.01	960	10,827	-	2,040	-	-	-	-	410	5,000	19,237
Total	27.34	18,240	73,818	367,740	2,040	690				6,293	18,750	487,571

4.3 NEW CONSTRUCTION

For new construction, the following standard costs have been applied to estimate the costs involved.

Table 4.3.1 Standard unit costs for new construction

Activity	Unit	Unit cost (NPR)
Opening up	km	900,000
Gravelling	km	2,700,000
Bridge construction	m	681,000

No new construction is required for the access to VDC headquarters of Mustang district.

Table 4.3.2 Cost estimate for new construction (NPR '000)

Code	Description	Length (km)	Opening up	Gravelling	Bridges	Total cost
Total						

4.4 DTPP COSTS

The total costs for the District Transport Perspective Plan come to NPR 528.5 million as indicated in the table below.

Table 4.4.1 DTPP costs (NPR '000)

Code	Conservation	Improvement	New construction	Total
42DR001	5,895	80,598	-	86,493
42DR002	13,740	36,971	-	50,711
42DR003	15,360	350,764	-	366,124
42DR004	6,015	19,237	-	25,252
Total	41,010	487,571	-	528,581

5. RANKING

The ranking of the required interventions determines the order in which they will be carried out. This ranking is done separately for conservation, improvement and new construction. Ranking is done according to the cost per person served, whereby the costs are the estimated costs of the previous chapter. For the calculation of the population served, use is made of the population data for the VDCs linked by the road concerned. This data is presented in **Annex 1**.

5.1 CONSERVATION

Ranking of roads for conservation is based on the total conservation costs per person served by the road. This ranking of roads will be updated each year in the ARMP based on the actual cost estimates for the year concerned. An example ranking is provided in the table below based on standard costs for the first year.

Table 5.1.1 Ranking of conservation works (NPR '000)

Code	Total length (km)	1. Emergency	2. Routine	3. Recurrent (paved)	4. Recurrent (gravel)	5. Recurrent (earth)	6. Periodic (blacktop)	7. Periodic (gravel)	Total cost (NPR '000)	Population served	Cost/person (NPR)
42DR001	3.93	118	79	-	-	983	-	-	1,179	1,550	761
42DR004	4.01	120	80	-	-	1,003	-	-	1,203	1,370	878
42DR002	9.16	275	183	-	-	2,290	-	-	2,748	1,190	2,309
42DR003	10.24	307	205	-	-	2,560	-	-	3,072	812	3,783

The allocation of maintenance funding will follow a specific sequence indicated below, and will be applied to the road ranking as defined in the ARMP. This will be of particular importance where funding is insufficient to cover all conservation costs.

1. Emergency maintenance
2. Routine maintenance
3. Recurrent maintenance paved roads
4. Recurrent maintenance gravel roads
5. Recurrent maintenance gravel roads
6. Periodic maintenance blacktop roads
7. Periodic maintenance gravel roads

5.2 IMPROVEMENT

In the case of improvement activities, ranking is again based on the basis of the total cost per person served. The resulting order of the roads is shown in the table below. In the case of roads requiring blacktopping, the improvement of the road has been split into two phases. The first phase includes all improvements to bring the road to a maintainable all-weather standard (gravelling, widening, cross drainage and protective structures), while the second phase only includes the blacktopping. This has been done to avoid unnecessarily delaying the improvement of such roads to all-weather gravel standard due to the additional cost of blacktopping (increasing the cost per person served).

Table 5.2.1 Ranking of improvement works (NPR '000)

Code	Total length (km)	Total cost (NPR '000)	Population served	Cost/person (NPR)
42DR004	4.01	19,237	1,370	14,042
42DR002	9.16	36,971	1,190	31,068
42DR001	3.93	80,598	1,550	51,999
42DR003	10.24	350,764	812	431,975

5.3 NEW CONSTRUCTION

For the roads proposed for new construction, ranking is also according to the cost per person served by the new road. But in case of Mustang District, new construction for joining VDC headquarters seems to be no need due to track open condition.

Table 5.3.1 Ranking of construction works (NPR '000)

Code	Length (km)	Total cost (NPR '000)	Population served	Cost/person (NPR)

6. DISTRICT TRANSPORT MASTER PLAN (DTMP)

The District Transport Master Plan (DTMP) that covers the next five years is prepared based on the projected financial resources available and the prioritized transport interventions as listed in the DTPP. Year-wise targets are prepared for the different roads and intervention types.

6.1 FIVE YEAR PROJECTED FINANCIAL RESOURCES

The projected financial resources for the next five years are estimated by considering all possible funding sources. The funding levels are based on the existing trend of funding. An annual increase in funding of 10% is assumed for all funding sources. The total district budget for the road sector is NPR 635.2 million for the five-year period.

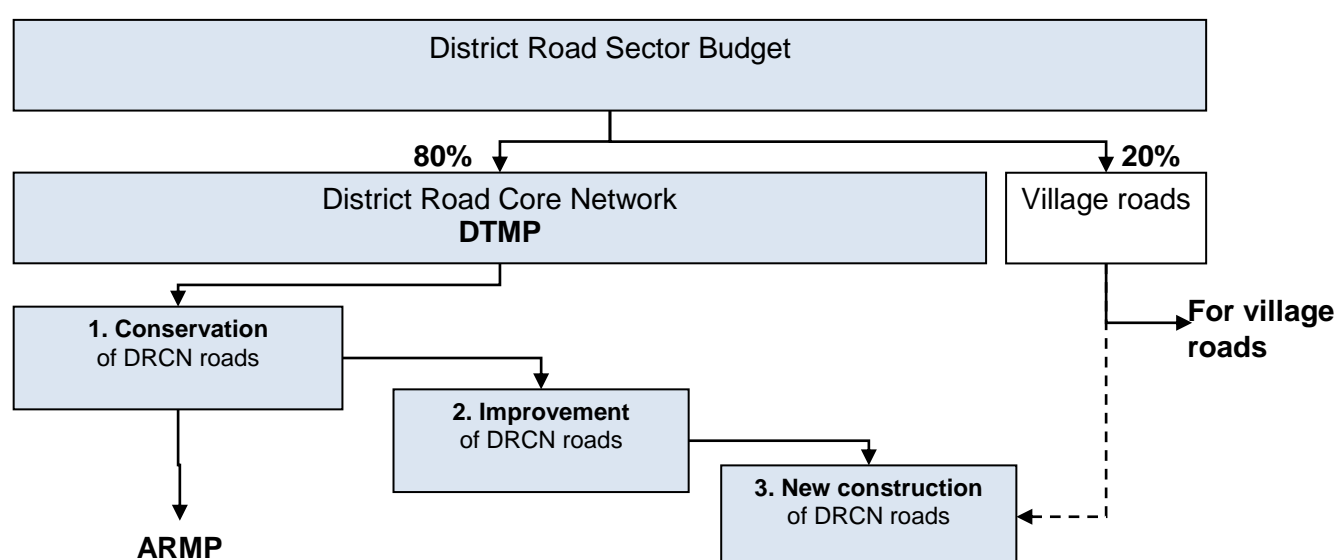
Table 6.1.1 Estimated funding levels (roads) for next five years (in NPR '000)

Funding source	2070/71	2071/72	2072/73	2073/74	2074/75
DDC Grant (30%)	9,570	10,527	11,580	12,738	14,011
Roads Board Nepal	1,500	1,650	1,815	1,997	2,196
Agricultural Road	8,800	9,680	10,648	11,713	12,884
Central Roads	5,100	5,610	6,171	6,788	7,467
LGCDP	1,000	1,100	1,210	1,331	1,464
RRRSDP (Donor Agency)	20,000	22,000	24,200	26,620	29,282
VDC Grant (20%)	36,263	39,889	43,878	48,266	53,093
Fund of Members of Parliaments (10% of total)	300	330	363	399	439
People Contribution (20% of Total)	21,513	23,664	26,030	28,633	31,497
Total	104,046	114,450	125,895	138,485	152,333
Grand total	635,209				

6.2 BUDGET ALLOCATION

The distribution of the available district road sector budget is indicated in the figure below. Due to the low number of village roads, 80% of the total budget is reserved for the district road core network. The remaining 20% is to be used by the DDC for the village roads, giving priority to emergency maintenance and routine/recurrent maintenance. The 80% of the district road sector budget for the DTMP is allocated firstly to conservation, secondly improvement, and any remaining funding is allocated to new construction.

Figure 5 District road sector budget allocation



Based on this distribution of the estimated budget, the available annual budget for each intervention type and the resulting district road core network length by surface type can be calculated. The results are shown in the following table.

Table 6.2.1 DTMP investment plan

Item				Year															
Fiscal year				2070/71		2071/72		2072/73		2073/74		2074/75							
Total budget				104,046		114,450		125,895		138,485		152,333							
Non-DRCN roads				20,809		22,890		25,179		27,697		30,467							
DRCN budget				83,236		91,560		100,716		110,788		121,867							
Core network length (km)				27.34		27.34		27.34		27.34		27.34							
Blacktop (km)				-		-		-		-		-							
Gravel (km)				-		14.09		17.57		20.06		22.82							
Earthen (km)				27.34		13.25		9.77		7.28		4.52							
Conservation (NPR '000)				8,202		13,837		15,228		16,227		17,331							
Emergency				820		820		820		820		820							
Routine				547		547		547		547		547							
Recurrent (blacktop)				-		-		-		-		-							
Recurrent (gravel)				-		5,635		7,026		8,025		9,129							
Recurrent (earthen)				6,835		3,313		2,444		1,820		1,130							
Periodic (blacktop)				-		-		-		-		-							
Periodic (gravel)				-		3,522		4,391		5,015		5,705							
Improvement	Cost	BT	GR	75,034	BT	GR	77,723	BT	GR	85,488	BT	GR	94,561	BT	GR	104,536	BT	GR	
42DR004	19,237	-	4.01	19,237	-	4.01	-	-	-	-	-	-	-	-	-	-	-	-	-
42DR002	36,971	-	9.16	36,971	-	9.16	-	-	-	-	-	-	-	-	-	-	-	-	-
42DR001	80,598	-	3.93	18,826	-	0.92	61,772	-	3.01	-	-	-	-	-	-	-	-	-	-
42DR003	350,764	-	10.24	-	-	-	15,951	-	0.47	85,488	-	2.50	94,561	-	2.76	104,536	-	3.05	-
Total improvement				75,034	-	14.09	77,723	-	3.48	85,488	-	2.50	94,561	-	2.76	104,536	-	3.05	
Construction	Cost	GR			GR			GR			GR			GR			GR		
42DR001																			
42DR002																			
42DR003																			
42DR004																			
Total new construction																			

6.3 DTMP OUTPUTS

Based on the investment plan presented above, all DRCN roads will be conserved for the duration of the DTMP period. A further 25.87 km will be improved to gravel standard. All of these roads will also receive the cross drainage and protective structures required to make them maintainable all-weather roads. The remaining 1.47 km of earthen roads at the end of the DTMP period will be improved in the next DTMP. The same goes for the new construction which will only take place after the existing DRCN roads have been improved to maintainable all weather standards (some of these roads may be constructed using VDC funding).

Table 6.3.1 DTMP output

Conservation	Improvement gravel	Improvement blacktop	New construction
27.34	25.87	-	-

Of the total DTMP budget, NPR 70.8 million will be spent on conservation and NPR 437.3 million on improvement. This will use up the entire DTMP budget for the five-year period.

6.4 DTMP OUTCOME

As a result of the activities planned in this DTMP, the percentage of all-weather maintainable DRCN roads increases by 95% from 0 km to 25.87 km, with only 5% (1.47 km) remaining fair weather.

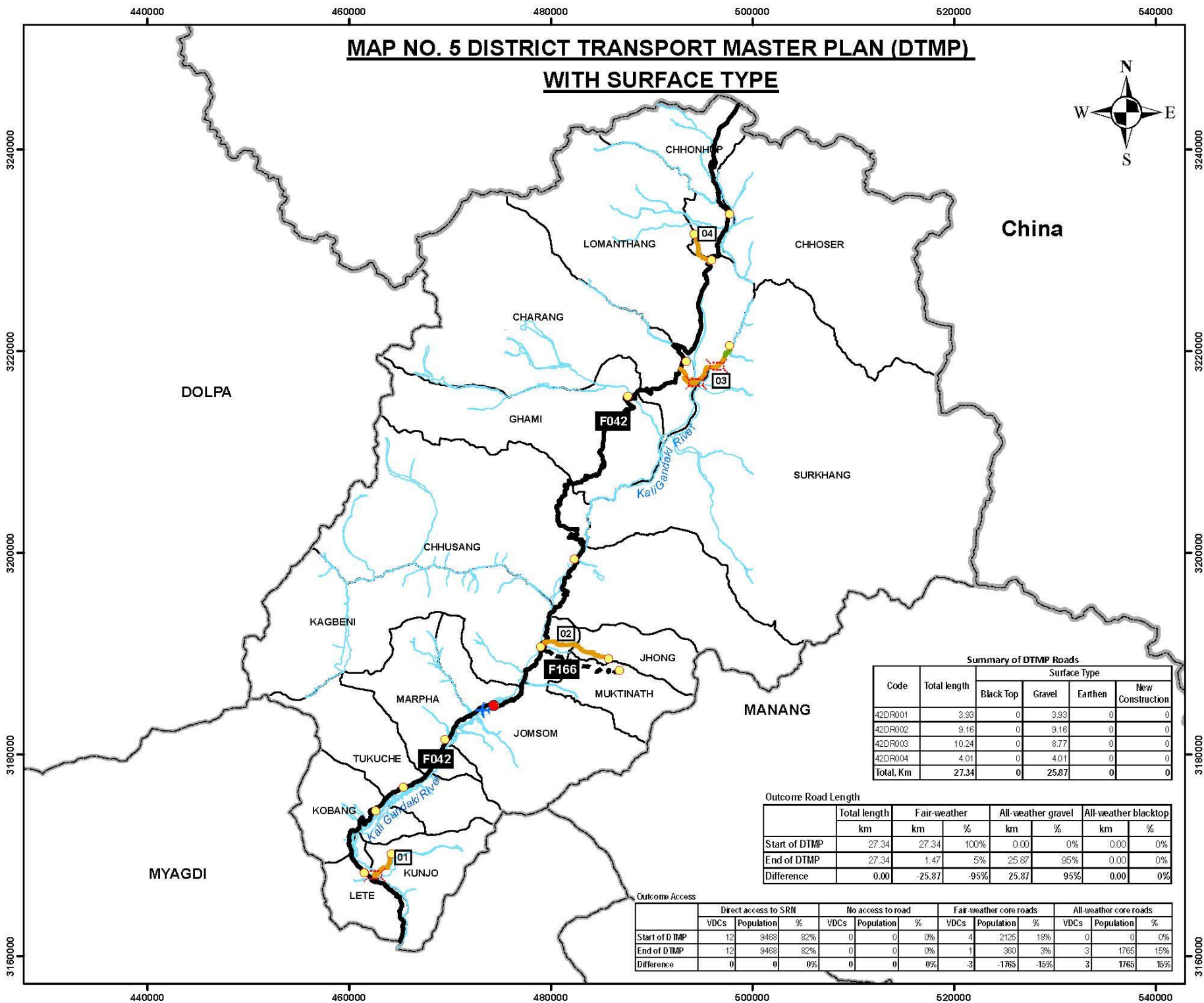
Table 6.4.1 Standard of DRCN roads

	Total length	Fair-weather		All-weather gravel		All-weather blacktop	
	km	km	%	km	%	km	%
Start of DTMP	27.34	27.34	100%	-	0%	-	0%
End of DTMP	27.34	1.47	5%	25.87	95%	-	0%
Difference	-	-25.87	-95%	25.87	95%	-	0%

The number of VDC headquarters with access to the SRN or all-weather DRCN roads will increase from 12 to 15 and the district population with access to the SRN or all-weather DRCN roads will increase from 82% to 97%. The number of VDC headquarters with no access to DRCN roads will remain at 0, while the percentage of the district population with no access to DRCN roads will remain at 0%.

Table 6.4.2 Population with access to road network

	Direct access to SRN			Access to fair-weather DRCN roads			Access to all-weather DRCN roads			No access to DRCN		
	VDCs	Population	%	VDCs	Population	%	VDCs	Population	%	VDCs	Population	%
Start of DTMP	12	9,468	82%	4	2,125	18%	0	-	0%	0	-	0%
End of DTMP	12	9,468	82%	1	360	3%	3	1,765	15%	0	-	0%
Difference	-	-	0%	-3	-1765	-15%	3	1,765	15%	-	-	0%



ANNEXES

ANNEX 1 TRAFFIC DATA

Code	Description	Total length (km)	Motor-cycle	Car-Jeep-Minibus	Tractor	Truck-Bus	PCU
42DR001	F042-Kunjo VDC Centre Road	3.93	3		1		4
42DR002	F042-Jhong Road	9.16	2	1	1		4
42DR003	F042-Dhye khola-Dhi Gaun Road	10.24			1		2
42DR004	F042-Thinger Chhonhup Road	4.01					-
Total		27.34					

ANNEX 2 POPULATION SERVED

	VDC	Population	DRCN roads				SRN
			42DR001	42DR002	42DR003	42DR004	
1	Charang	452			X		X
2	Chhonhup	801				X	
3	Chhoser	529					X
4	Chhusang	512					X
5	Ghami	611					X
6	Jhong	253		X			
7	Jomsom	1,370					X
8	Kagbeni	937		X			X
9	Kobang	727					X
10	Kunjo	711	X				
11	Lete	839	X				X
12	Lomanthang	569				X	X
13	Marpha	1,551					X
14	Muktinath	628					X
15	Surkhang	360			X		
16	Tukuche	743					X
	Total population	11,593	1,550	1,190	812	1,370	9,468
	Total VDCs/municipalities	16	2	2	2	2	12

Source: Nepal Population and Housing Census 2011

ANNEX 3 LOCATION OF PROPOSED INTERVENTIONS

Road code	Road Name	Length (km)	Start chainage (km) or X-coordinate	End chainage (km) or Y-coordinate	Rehabilitation (km)	Gravelling (km)	Blacktopping (km)	Widening (m)	Bridge (m)	Slab culvert (m)	CC Causeway (m)	Stone Causeway (m)	Pipe culvert (units)	Masonry walls (m3)	Gabion walls (m3)	Lined drain (m)
42DR001	F042- Kunjo VDC Center Road	3.93	0+000	3+930		3.93		320	80						620	2000
42DR002	F042- Jhong Road	9.16	0+000	9+160		9.16		160			6				320	2500
42DR003	F042- Dhye khola- Dhi Gaun Road	10.24	0+000	10+240		10.24		240	460						350	1000
42DR004	F042-Thinger Chhonhup Road	4.01	0+000	4+010		4.01		40		12					90	2000
Total		27.34			0	27.34	0	760	540	12	6	0	0	0	1380	7500

ANNEX 4 APPROVAL LETTERS & MINUTES



नेपाल सरकार
सङ्घीय मामिला तथा स्थानीय विकास मन्त्रालय

फोन नं. :- ०६९-४४०१४३
४४००४४

जिल्ला विकास समितिको कार्यालय मुस्ताङ

पत्र संख्या :- ०६९/०७०
चलानी नं. :- १०८१

मिति :- २०७०/०२/१४

विषय : जिल्ला यातायात गुरुयोजना सम्बन्धमा ।

श्री स्थानीय पूर्वाधार विकास तथा ग्रामीण सडक विभाग
स्थानीय यातायात पूर्वाधार क्षेत्रगत कार्यक्रम (RTISWAp)
श्रीमहल पुल्चोक, ललितपुर ।

उपरोक्त सम्बन्धमा, RTISWAp र GOEC Nepal (P) Ltd. काठमाण्डौ बिच मुस्ताङ जिल्लाको यातायात गुरुयोजना तयार गर्नका लागि भएको सम्झौता बमोजिम मिति २०७०/२/१४ गते जि.वि.स. मुस्ताङमा कार्यशाला गोष्ठीमा यस जिल्लाका राजनैतिक दल एवं प्रतिनिधि, जि.वि.स. जिल्ला प्राविधिक कार्यालय र अन्य सरोकारवालाहरुको बिचमा विस्तृत छलफल पश्चात यस जिल्लाको यातायात गुरुयोजना पारित भएको व्यहोरा जानकारीका लागि अनुरोध गरिन्छ ।

डिल्लीराम सिग्देल

स्थानीय विकास अधिकारी

(Handwritten signatures and names)

① प्रविनिर्धो, नेष्ठा - भास्वोवादी श्री प्रजापति वि. क.
 श्री प्र. ना. उ. वि. श्री. हर्ष नरहरि शाह
 श्री वि. वि. वि. श्री. सुवराज पंडित
 श्री स. वि. प्र. वि. श्री. सुवराज पंडित
 श्री वि. वि. वि. श्री. सुवराज पंडित
 श्री वि. वि. वि. श्री. सुवराज पंडित

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उपस्थिति

३० " बा. प्र. पा. श्री नर वहादुर दिशाचन
 नेउपा- भाडोवाडी श्री सज्जन नैव. कुठ
 प्रा- शिब कलम मे - (२) -

का. सुभाष राज सापका (जि. स्वा. का)
मम/ सुभाष राज सापका जि. स्वा. का

Ques :- इ. वि. का अर्थ है A. वि. का अनुपात (Lg & Dg)

हृदय प्रसाद मेढा जि. म. सं. क.

मिहिराई दिवस २१ एप्रिल (बंगलादेश) श्री. श्री. डि. का मुख्यालय, ले.

जमीन रणारज पौड्याल जेठे माहेसो जेठे माहेसो मुलास.

गोएर इंजीनियरिंग

डा. पद्म व. शाही. Project Director

2. चन्द्र प्रकाश शर्मा, जि. इलाहाबाद

२. विनय राई - GoEC Nepal
 ३. केवल पदधार - GoEC Nepal

निर्णयहरू:

① DRCN (जिल्ला सडक संजाल) का निम्न तलका सडकहरूलाई मात्तै निर्वाह गरियो।

- क. F042 - मोडा, सडक (डागावेनी - मोडा - मुक्तिनाथ सडक)
- ख. F042 - न्यामडा - होनुप सडक
- ग. F042 - धैखोला - दिग गाउँ सडक
- घ. F042 - कुम्जा सडक

② VRCN र DRCN को लागि बजेट छुट्याउदा - VRCN को लागि २०% र DRCN को लागि ८०% छुट्याउने निर्णय गरियो।

(Signature)

७/१६/२०
 २०७५/१२/१६

ANNEX 5 DATA COLLECTION AND GIS PROCESSING

A. DATA COLLECTION PROCESS

As mentioned in DTMP Guidelines 2012, the data collection procedure has been conducted. Some of the general data such as district area, population, hydrological and metrological data, SRN status has been collected from secondary sources like Central Bureau of Statistics Nepal, Profile of Nepal 2013 and DoR Publications. For Primary data collection, i.e. Existing Road Inventory; GPS (model C60s and C62s) and Motorcycle has been used. Further for DRCN (new roads), Topographic maps (1:25000) in hard copy and soft copy with aid of Google Earth has been used.

B. GIS PROCESSING FOR MAP PREPARATION

The map preparation process is governed by the field work and field work is ruled by the proper adjustment in GPS. For setting the GPS, we have followed the following steps

1. Set the GPS for units and time
2. For position, select USER UTM Grid defined from the list for grid and define the properties as below:

Latitude of origin	E84
Scale factor	0.9999
False easting	500000 Meter
False northing	0 Meter
Select Datum	WGS84

After collection of the data in waypoint and track format, it is imported to computer by DNR Garmin Software and exported in KML and GPX format. The KML or GPX data is added to ARC GIS 9.3 and exported to Shape file. Added Shape file of Track is edited and append in **Road_Inventory.shp** whose property is given below,

Projected Coordinate System:	Modified_UTM84
Projection:	Transverse_Mercator
False_Easting:	500000.00000000
False_Northing:	0.00000000
Central_Meridian:	84.00000000
Scale_Factor:	0.99990000
Latitude_Of_Origin:	0.00000000
Linear Unit:	Meter
Geographic Coordinate System:	GCS_Everest_1830
Datum:	D_Everest_Adj_1937
Prime Meridian:	Greenwich
Angular Unit:	Degree

Now, for transferring the **Road_Inventory.shp** doesnot require to transform in Google Earth format, it will directly overlay above the Google Earth with some minimum error. But for remaining general shape file, they should be transformed from Topo to Google Earth.

ANNEX 6 PHOTOGRAPHS



Photo 1 Workshop for DTMP Mustang



Photo 2 VDC Headquarter, Chhonhup



Photo 3 Absence of proper draianage system



Photo 4 Existing Jomsom-Ghoktang Road (F042)



Photo 5 Existing Transport Service by 4 Wheeled Vehicle (Truck) in SRN

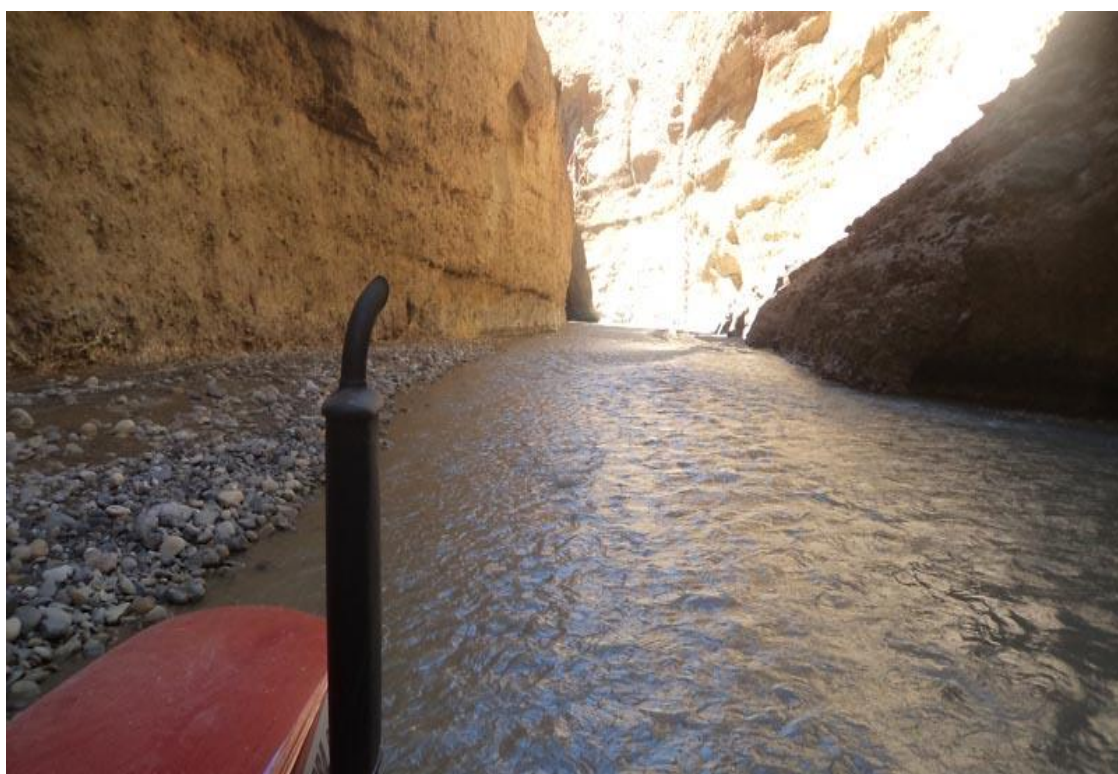


Photo 6 Existing Transport Service in Seasonal Road (Kali Gandaki Gorge Alternative Route)



Photo 7 Existing SRN Condition in Ghami Section



Photo 8 Protection work required in Existing SRN



Photo 9 Jomsom Bazar Viewed from Thini Route



Photo 10 Water Crossing Structure Required for access to Surkhang VDC HQ