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,
Manang

Vol I: Main Report

August 2013

Submitted by GOEC Nepal Pvt. Ltd. for the District Development Committee (DDC) and District Technical Office (DTO), for Manang 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

MANANG DISTRICT

2013

Government of Nepal
Ministry of Federal Affairs and Local Development
Office of the District Development Committee
Manang

Ph. No: 066-440244
Fax: 019-442014

Ref No: 2069/070
Dispatch No:

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FOREWORD

It is my great pleasure to introduce this revised District Transport Master Plan (DTMP) of Manang district which was concurred by the district stakeholder's meeting held on 28 March 2013, passed by DDC Board Meeting of 28 March 2013 and approved by the DDC Council on 5 July 2013. Based on the DTMP Guideline 2012, all together 6 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 Er. Krishna Acharya, District Engineer (DTO), Govinda Ranabhat Program 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.

.....
Prem Raj Giri
Local Development Officer

Local Development Officer

PREFACE / ACKNOWLEDGEMENTS

This DTMP Report for Manang 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-coordinatorSDE– Mr Ganga BahadurBasnet, SDEs-Mr Manoj Krishna Shresthaand Mr JeewanGuragain, Contracts Officer-Mr Ramesh Lal Shresthaof DoLIDARare highly grateful for the support.

Last but not the least we are very grateful with the LDO- Manang, Mr Prem Raj Giri, DTO- Mr Krishna Acharya and other staffs of Manang DDC and other local peoples of Manang, 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

Manang district is located in Gandaki zone of the Western Development Region of Nepal. It is border with China to the North, Gorkha and Lamjung to the East, Lamjung and Kaski to the South, Mustang and Myagdi to the West. The district has 13 VDCs, 9 Ilakas and 1 constituency areas. The total area of the district is 2,246 sq. km. The district lies in Hills and Mountain. The lowest elevation point is 1,880 m and the highest elevation point is 8,163 m from the mean sea level. As a result of the elevation differences, the district has three different types of climate: sub-tropical from 1000-2000 m and temperate above 2000 m. The annual rainfall is about 745.4 mm and temperature vary from 5.65^{o}C to 17.11^{o}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 75 km of roads, including 30 km of strategic roads and 45 km of rural roads. In coordination with the DTICC and DDC, 2 rural roads with a length of 42km were identified as making up the district road core network (DRCN) from existing roads, and remaining 3 km village roads were classified as village roads. The existing DRCN roads link up 8 of the 13 VDC headquarters. All of the DRCN roads are earthen fair-weather roads.

Road Class	Total length	Black Top	Gravel	Earthen
Strategic road network	30.00	-	-	30.00
District road core network	41.56	-	-	41.56
Village roads	3.20	-	-	3.20
Total	**74.76**	**-**	**-**	**74.76**

Annual conservation costs are estimated at NPR 12.5 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 62.34million. 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	710	m	216,750,000
2	Slab culverts	8	m	1,600,000
3	Causeways	121	m	387,200
4	Hume pipes	0	units	-
5	Masonry retaining walls	0	m^3	-
6	Gabion retaining walls	1376	m^3	6,880,000
7	Lined drains	500	m	2,250,000
8	Widening	40	m	1,000,000
9	Rehabilitation	0	km	-
10	Gravelling	41.56	km	112,212,000
11	Blacktopping	0	km	-
12	New construction	44.19	km	912,611,000
	Total			**1,253,690,200**

The available budget for the road sector for the coming five years (fiscal year 2070/71 to 2074/75) is estimated to be NPR 1,062 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 41.56km of existing roads will be gravelled (100%) and brought to a maintainable all-weather standard. New construction will also be forwarded up to 17.85 km out of 44.19 km. VDC headquarters with access to all-weather DRCN roads or the SRN will increase from 3 to 11, while the percentage of the district population with such access will increase from 46% to 91%.

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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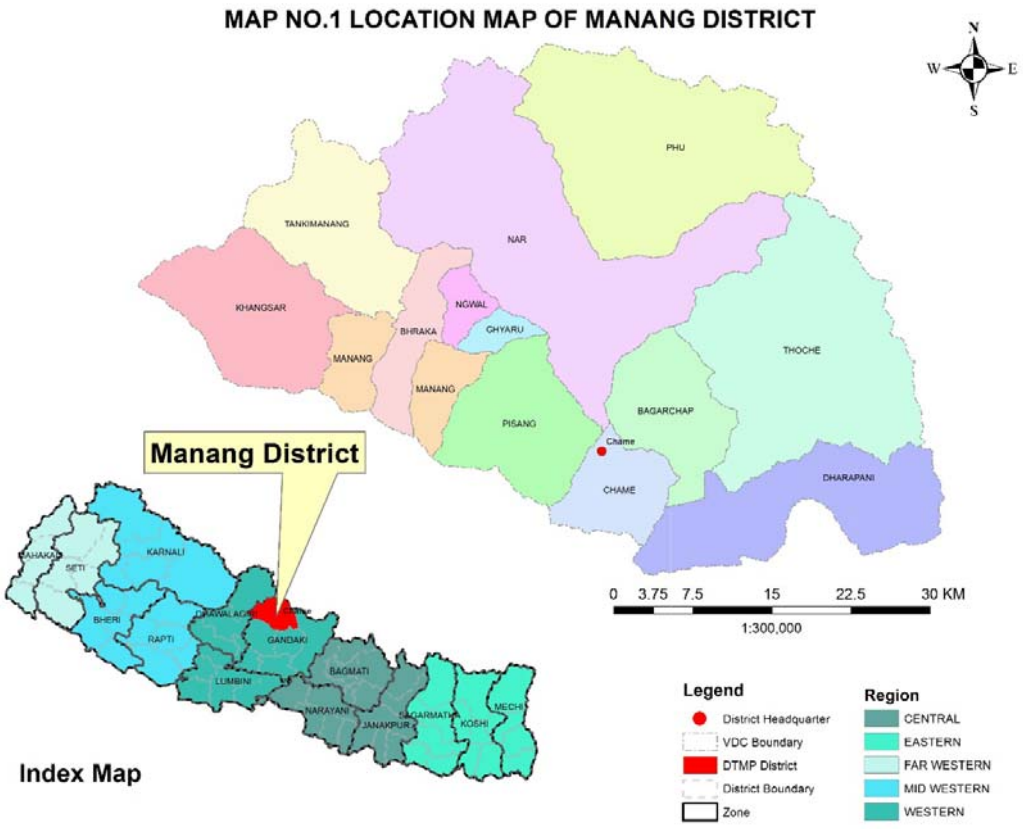
1. INTRODUCTION

Manang district is located in Gandaki zone of the Western Development Region of Nepal. It is border with China to the North, Gorkha and Lamjung to the East, Lamjung and Kaski to the South, Mustang and Myagdi to the West. The district has 13 VDCs, 9 Ilakas and 1 constituency areas. The total area of the district is 2,246 sq. km. The district lies in Hills and Mountain. The lowest elevation point is 1,880 m and the highest elevation point is 8,163 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 745.4 mm and temperature vary from 5.65^{o}C to 17.11^{o}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 6,538 comprising 2,877 female (44.01%) and 3,661 male (55.99%) residing in 1,480 households. Manang district has an average population density of around 2.91 people per sq. km. The average family size is 5.4. Life expectancy of the people is 52 years. The average literacy rate is about 59.91% (52.11% female and 66.87% male are literate). The major ethnic groups in the district are Tamang and Gurung and others are like Brahmin, Chhetris, Kami, Damais etc. Major languages spoken in the district are Nepali and Gurung.

Since the roads are just being constructed, the accessibility is not so easy but it is improving. The district is connected by Feeder Road (F036) which starts from Besisahar via Satale to Chame (District Headquarter). The district is not connected by any blacktopped road.

2. DISTRICT ROAD CORE NETWORK (DRCN)

This chapter gives an overview of the existing roads in Manang 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

Manang district has an estimated road network of 75 kilometres, inclucing 30 kilometres of strategic roads managed by DOR and 45 kilometres of rural roads managed by Manang 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 Manang 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	30.00	-	-	30.00
Urban roads	-	-	-	-
Rural roads	44.76			44.76
Total	**74.76**	**-**	**-**	**74.76**

2.2 NATIONAL HIGHWAYS AND FEEDER ROADS

Manang district has only 1 Feeder Road (Satale - Chame Road) of 30 km. The Satale - Chame road is under Nepal Army which will later transfer to Government of Nepal i.e. DoR. Since, the construction seems to be one the most extreme development in the phase of road development in Nepal where more than 13 people has been killed during the construction of the road.

Table 2.2.1 National Highways and Feeder Roads (km)

Code	Description	Total length	Black Top	Gravel	Earthen
F036	Satale - Chame Road	30	-	-	30
Total		30	-	-	30

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 Manang district is shown in Figure 3 at the end of this chapter. The DRCN covers 8 VDCs out of 13 VDCs. The DRCN consists of 2 district roads with a total length of 41.56 km which covers all the existing rural roads. Therefore, village road seems to be null. 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	30	-	-	30.00
Highways	-	-	-	-
Feeder roads	30	-	-	30.00
Urban roads	-	-	-	-
District road core network	41.56	-	-	41.56
Village roads	3.20	-	-	3.20
Total	**74.76**	**-**	**-**	**74.76**

Table 2.3.2 District road core network (km)

Code	Description	Total length	Black Top	Gravel	Earthen	All weather	Fair weather
41DR001	F036(Chame)- Khansar Road	38.36			38.36	-	38.36
41DR002	Mugje Ngwal Road	3.20			3.20	-	3.20
Total		**41.56**			**41.56**		**41.56**

2.4 VILLAGE ROADS

The 3.2 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 13 VDCs in Manang district. In the case of Manang District, 41VR001 road is considered to be national concern road although it is VRCN.

Table 2.4.1 Village Road Network (km)

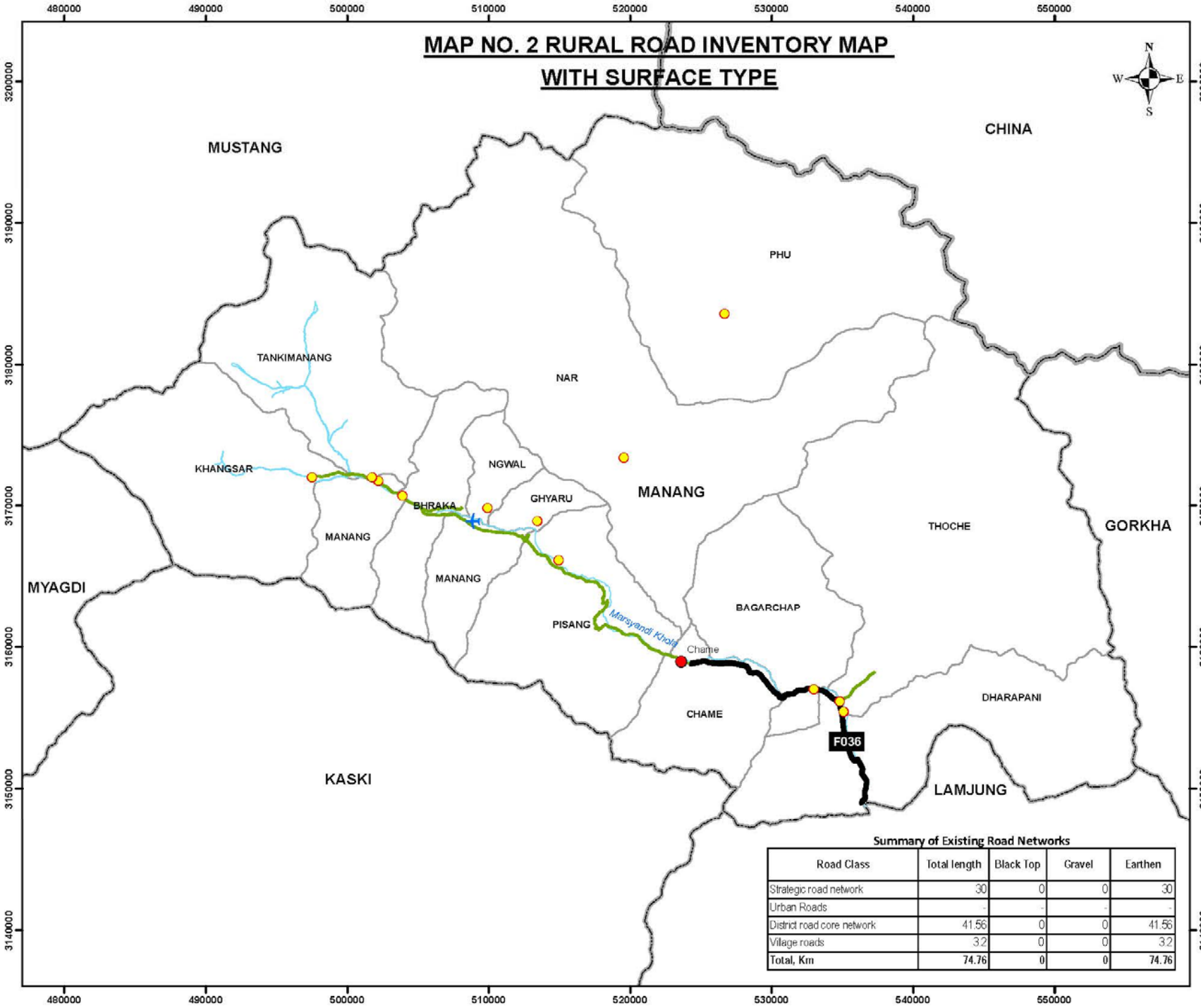
Code	Description	Total Existing length
[1]41VR001	Thoche Tilche Larke Pass Road	3.2
Total		**3.2**

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 maintenanceto keep the village roads open.

[1]Local People and stakeholder of the district are interested to convert 41VR001 into District road by extending 41DR006 up to Tilche from Dharapani.

MAP NO. 2 RURAL ROAD INVENTORY MAP WITH SURFACE TYPE



Legend

- Airport (Humde)
- District Headqua
- VDC Centre
- SRN Road
- Rural Road (Ea
- River
- VDC Boundary
- District Boundar
- International Bo

Name of District	District D Committe
Project	Preparation of Dist Master Plan
Technical Assistance	MoFALD, DoLIDA Maintenance Pilot
Grant Supported By	Department For In Development (DFI
Consultant	GOEC Nepal Pvt Buddhanagar, Kat
Source	Department of Sur

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Scale Information

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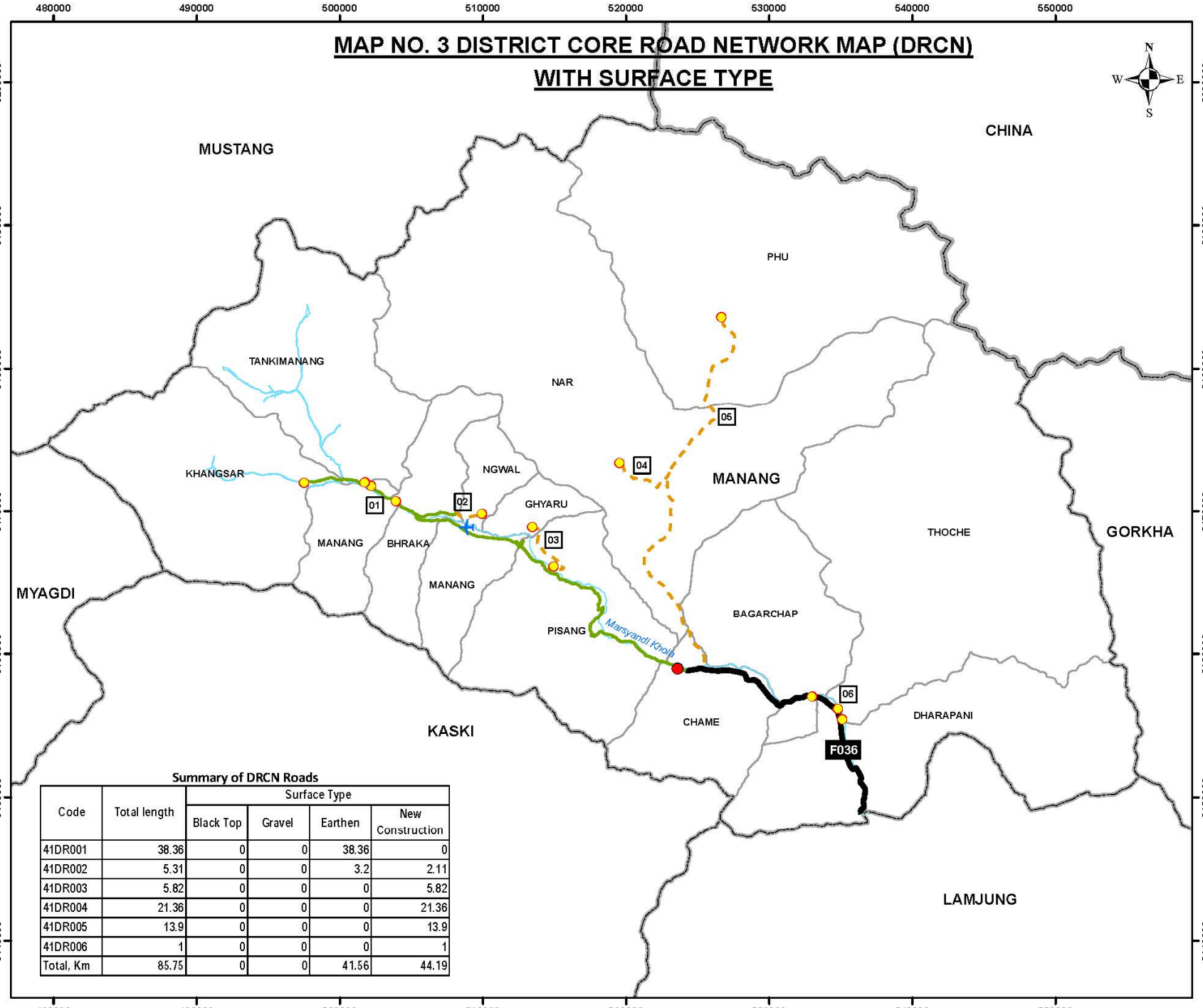
1:250,000

Summary of Existing Road Networks

Road Class	Total length	Black Top	Gravel	Earthen
Strategic road network	30	0	0	30
Urban Roads	-	-	-	-
District road core network	41.56	0	0	41.56
Village roads	3.2	0	0	3.2
Total, Km	**74.76**	**0**	**0**	**74.76**

MAP NO. 3 DISTRICT CORE ROAD NETWORK MAP (DRCN) WITH SURFACE TYPE



Summary of DRCN Roads

Code	Total length	Surface Type			
		Black Top	Gravel	Earthen	New Construction
41DR001	38.36	0	0	38.36	0
41DR002	5.31	0	0	3.2	2.11
41DR003	5.82	0	0	0	5.82
41DR004	21.36	0	0	0	21.36
41DR005	13.9	0	0	0	13.9
41DR006	1	0	0	0	1
Total, Km	85.75	0	0	41.56	44.19

Legend

- Airport (Humde)
- District Headqua
- VDC Centre
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Scale Information

0 1.5 3 6 9

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3. DISTRICT TRANSPORT PERSPECTIVE PLAN (DTPP)

This chapter looks at the required interventions regarding conservation, improvement and new constructionof 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)
41DR001	38.36	38.36	38.36	38.36
41DR002	3.20	3.20	3.20	3.20
Total	**41.56**	**41.56**	**41.56**	**41.56**

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 Manang 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 50passenger 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 Manang this concerns the total of 292 km of DRCN roads.

Table 3.2.2 Sections of the district road core network requiring gravelling

Code	Description	Total length (km)	Gravelling (km)
41DR001	F036(Chame) Khansar Road	38.36	38.36
41DR002	Mugje Ngwal Road	3.20	3.20
Total		**41.56**	**41.56**

3.2.3 CROSS DRAINAGE

The need for cross drainage was identified for the different DRCN roads. The total length of 255 m bridge, 8 m total length of slab culvert and121 m total length of Stone 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)
41DR001	F036(Chame) Khansar Road	245	8		121	

Code	Description	Bridge (m)	Slab culvert (m)	CC Causeway (m)	Stone Causeway (m)	Pipe culvert (units)
41DR002	Mugje Ngwal Road	10				
Total		**255**	**8**		**121**	

3.2.4 PROTECTIVE STRUCTURES

Based on the road survey carried out in Manang, 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)
41DR001	F036(Chame) Khansar Road		1,376	500
41DR002	Mugje Ngwal Road			
Total		**-**	**1,376**	**500**

3.2.5 WIDENING

Widening of the district road core network in Manang 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)
41DR001	F036(Chame) Khansar Road	38.36	40
41DR002	Mugje Ngwal Road	3.20	
Total			**40**

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 required to connect the remaining VDC headquarters. A list of proposed roads for new construction is provided below. These roads provide access to 5 VDC HQs that do not currently have road access.

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

Code	Description	New VDCs	Existing length	New length	Bridge (m)
41DR001	F036(Chame) Khansar Road		38.36		
41DR002	Mugje Ngwal Road	Ngwal	3.20	2.11	
41DR003	Pisang Gyaru Road	Ghyaru	-	5.82	50
41DR004	F036 (Koto) Meta Nar Road	Nar	-	21.36	270
41DR005	Meta Phu Road	Phu	-	13.90	85
41DR006	F036(Dharapani) Thoche Road	Thoche	-	1.00	50
Total			**41.56**	**44.19**	**455**

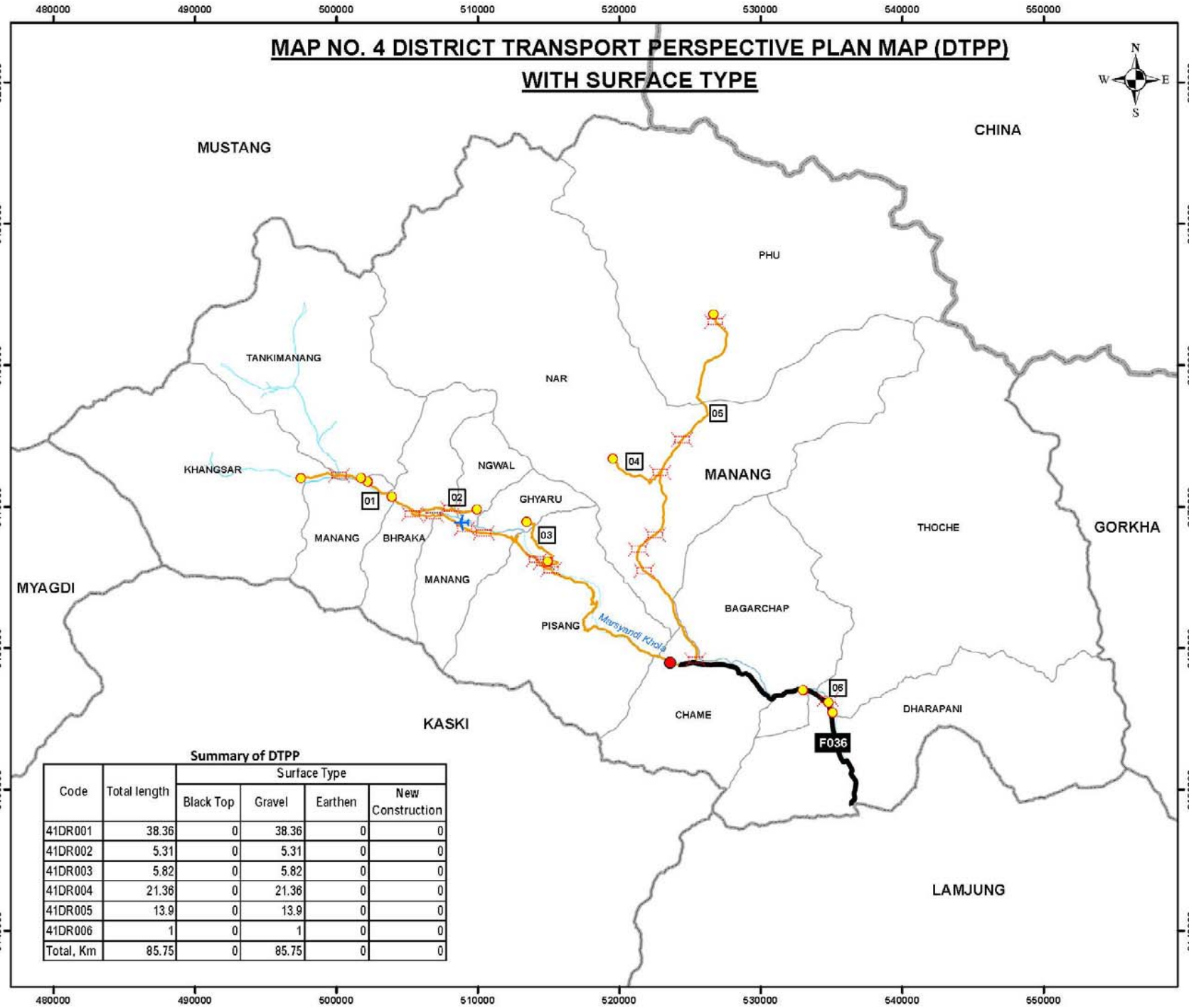
3.4 DISTRICT TRANSPORT PERSPECTIVE PLAN

The DTPP foresees bringing the entire existing district road core network to maintainable all-weather status, and expanding it to provide access to an additional 5 VDC headquarters. For this purpose, all 41.56 km will be gravelled and a number of different cross drainage and protective structures will be constructed. A further 44.19 km of new road will be constructed to maintainable all-weather gravel standard providing access to 5 additional VDC HQs. The district road core network will subsequently consist of 85.75 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)
41DR001	38.36	38.36	38.36	38.36	-	38.36	-	40.00	245.00	8.00	-	121.00	-	-	1,376.00	500.00	-
41DR002	3.20	3.20	3.20	3.20	-	3.20	-	-	10.00	-	-	-	-	-	-	-	2.11
41DR003	-	-	-	-	-	-	-	-	50.00	-	-	-	-	-	-	-	5.82
41DR004	-	-	-	-	-	-	-	-	270.00	-	-	-	-	-	-	-	21.36
41DR005	-	-	-	-	-	-	-	-	85.00	-	-	-	-	-	-	-	13.90
41DR006	-	-	-	-	-	-	-	-	50.00	-	-	-	-	-	-	-	1.00
Total	41.56	41.56	41.56	41.56	-	41.56	-	40	710	8	-	121	-	-	1,376	500	44.19

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



Legend

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

Summary of DTPP

Code	Total length	Surface Type			
		Black Top	Gravel	Earthen	New Construction
41DR001	38.36	0	38.36	0	0
41DR002	5.31	0	5.31	0	0
41DR003	5.82	0	5.82	0	0
41DR004	21.36	0	21.36	0	0
41DR005	13.9	0	13.9	0	0
41DR006	1	0	1	0	0
Total, Km	85.75	0	85.75	0	0

Name of District	District Development Committee, Manang
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

0 1.5 3 6 9 12 KM

1:250,000

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 12.5million. Based on this cost for the first year, the costs for conservation of the DRCN for the next 5 years are estimated at NPR 62.34 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
41DR001	38.36	-	-	38.36	1,151	767	-	-	9,590	-	-	11,508	57,540
41DR002	3.20	-	-	3.20	96	64	-	-	800	-	-	960	4,800
Total	**41.56**	**-**	**-**	**41.56**	**1,247**	**831**	**-**	**-**	**10,390**	**-**	**-**	**12,468**	**62,340**

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	25,000
Gravelling	km	2,700,000

Activity	Unit	Unit cost (NPR)
Blacktopping	km	5,700,000
Bridge construction	m	850,000
Slab culvert construction	m	200,000
CC Causeway construction	m	150,000
Stone Causeway construction	m	3,200
Pipe culvert placement	unit	25,000
Masonry wall construction	m^3	10,000
Gabion wall construction	m^3	5,000
Lined drain construction	m	4,500

The resulting estimated costs come to NPR 341 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 causeways	Stone causeways	Pipe culvert	Gabion walls	Lined drains	Total cost
41DR001	38.36	1,000	103,572	208,250	1,600	-	387	-	6,880	2,250	323,939
41DR002	3.20	-	8,640	8,500	-	-	-	-	-	-	17,140
Total	**41.56**	**1000**	**112,212**	**216,750**	**1,600**	**-**	**387**	**-**	**6,880**	**2,250**	**341,079**

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	9,200,000
Gravelling	km	2,700,000
Bridge construction	m	850,000

The resulting estimated costs for new construction come to NPR 912.6 million.

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

Code	Description	Length (km)	Opening up	Gravelling	Bridges	Total cost
41DR002	Mugje Ngwal Road	2.11	19,412	5,697	-	25,109
41DR003	Pisang Gyaru Road	5.82	53,544	15,714	42,500	111,758
41DR004	F036 (Koto) Meta Nar Road	21.36	196,512	57,672	229,500	483,684
41DR005	Meta Phu Road	13.90	127,880	37,530	72,250	237,660
41DR006	F036(Dharapani)- Thoche Road	1.00	9,200	2,700	42,500	54,400
Total		**44.19**	**406,548**	**119,313**	**386,750**	**912,611**

4.4 DTPP COSTS

The total costs for the District Transport Perspective Plan come to NPR 1,316 million as indicated in the table below.

Table 4.4.1 DTPP costs (NPR '000)

Code	Conservation	Improvement	New construction	Total
41DR001	57,540	323,939	-	381,479
41DR002	4,800	17,140	25,109	47,049
41DR003	-	-	111,758	111,758
41DR004	-	-	483,684	483,684
41DR005	-	-	237,660	237,660
41DR006	-	-	54,400	54,400
Total	**62,340**	**341,079**	**912,611**	**1,316,030**

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)
41DR002	3.20	96	64	-	-	800	-	-	960	580	1,655
41DR001	38.36	1,151	767	-	-	9,590	-	-	11,508	3,006	3,828

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)
41DR002	3.20	17,140	580	29,552
41DR001	38.36	323,939	3,006	107,764

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. The resulting ranking is indicated in the table below.

Table 5.3.1 Ranking of construction works (NPR '000)

Code	Length (km)	Total cost (NPR '000)	Population served	Cost/person (NPR)
41DR006	1.00	54,400	1,394	39,024
41DR002	2.11	25,109	580	43,291
41DR003	5.82	111,758	378	295,656
41DR004	21.36	483,684	1,491	324,402
41DR005	13.90	237,660	538	441,747

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 existingtrend 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 1,062 million for the five-year period.

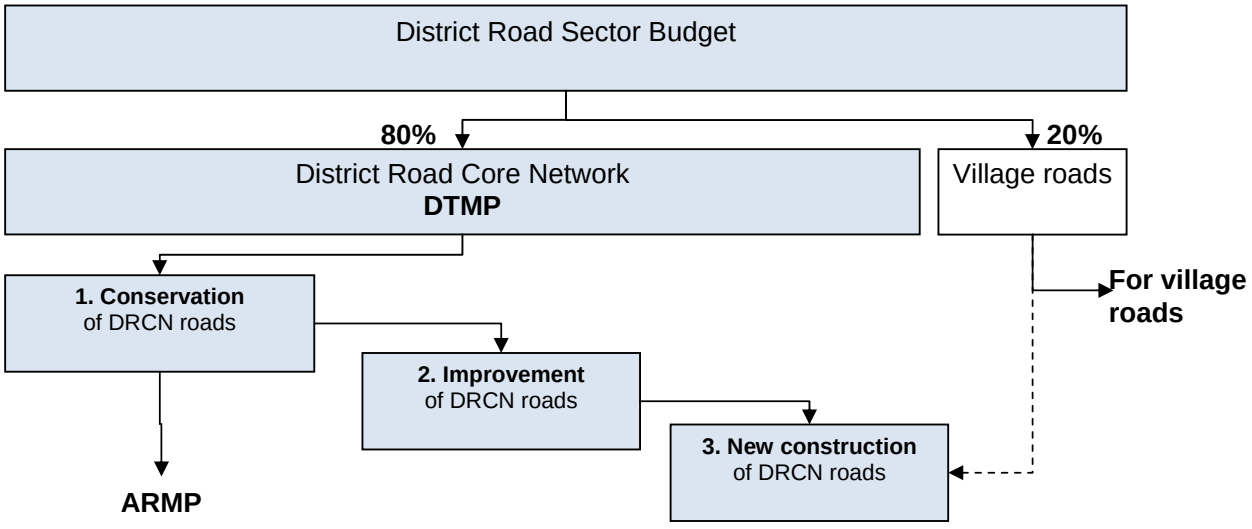
Table 6.1.1 Estimated funding levels (roads) for next five years (in NPR '000)

Funding source	2070/71	2071/72	2072/73	2073/74	2074/75
RTI SWAp	13,050	14,355	15,791	17,370	19,107
LGCDP	1,000	1,100	1,210	1,331	1,464
RRRSDP/DRLIP/RAP	141,809	155,990	171,589	188,748	207,623
VDC Grant (10%)	2,218	2,439	2,683	2,952	3,247
People Contribution (10% of Total)	15,808	17,388	19,127	21,040	23,144
Total	**173,884**	**191,273**	**210,400**	**231,440**	**254,584**
Grand total	**1,061,581**				

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 (Thoche Tilche Larke Pass Road or other as required), giving priority to emergency maintenance and routine/recurrent maintenance. Alternatively, this 20% may be used for the new construction of DRCN roads where this is considered a priority by the district. 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				173,884			191,273			210,400			231,440			254,584		
Non-DRCN roads				34,777			38,255			42,080			46,288			50,917		
DRCN budget				**139,107**			**153,018**			**168,320**			**185,152**			**203,667**		
Core network length (km)				**41.56**			**41.56**			**41.56**			**41.56**			**41.56**		
Blacktop (km)				-			-			-			-			-		
Gravel (km)				-			16.17			32.04			41.56			41.56		
Earthen (km)				41.56			25.39			9.52			-			-		
Conservation (NPR '000)				**12,468**			**18,935**			**25,286**			**29,092**			**29,092**		
Emergency				1,247			1,247			1,247			1,247			1,247		
Routine				831			831			831			831			831		
Recurrent (blacktop)				-			-			-			-			-		
Recurrent (gravel)				-			6,467			12,818			16,624			16,624		
Recurrent (earthen)				10,390			6,348			2,379			-			-		
Periodic (blacktop)				-			-			-			-			-		
Periodic (gravel)				-			4,042			8,011			10,390			10,390		
Improvement	**Cost**	**BT**	**GR**	**150,806**	**BT**	**GR**	**159,522**	**BT**	**GR**	**169,926**	**BT**	**GR**	**188,225**	**BT**	**GR**	**209,957**	**BT**	**GR**
41DR002	17,140	-	3.20	17,140	-	3.20	-	-	-	-	-	-	-	-	-	-	-	-
41DR001	323,939	-	38.36	109,499	-	12.97	134,083	-	15.88	80,356	-	9.52	-	-	-	-	-	-
Total improvement				**126,639**	**-**	**16.17**	**134,083**	**-**	**15.88**	**80,356**	**-**	**9.52**	**0**	**-**	**0.00**	**-0**	**-**	**-0.00**
Construction	**Cost**	**GR**			**GR**			**GR**		**62,678**	**GR**		**156,060**	**GR**		**174,575**	**GR**	
41DR006	49,640	1.00								54,400	1.00			-		-		
41DR002	25,109	2.11								8,278	0.70		16,831	1.41				
41DR003	111,758	5.82								-	-		111,758	5.82				
41DR004	483,684	21.36								-	-		27,471	1.21		174,575	7.71	
41DR005	237,660	13.90																
Total new construction										**62,678**	**1.70**		**156,060**	**8.45**		**174,575**	**7.71**	

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 41.56 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 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). The remaining 26.34 km of new construction roads at the end of the DTMP period will be constructed in the next DTMP.

Table 6.3.1 DTMP output

Conservation	Improvement gravel	Improvement blacktop	New construction
41.56	41.56	-	17.85

Of the total DTMP budget, NPR 114.8 million will be spent on conservation, NPR 341 million on improvement and NPR 393 million on New Construction. 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 100% from 0km to 41.56km, with0% (0km) remaining fair weather.

Table 6.4.1 Standard of DRCN roads

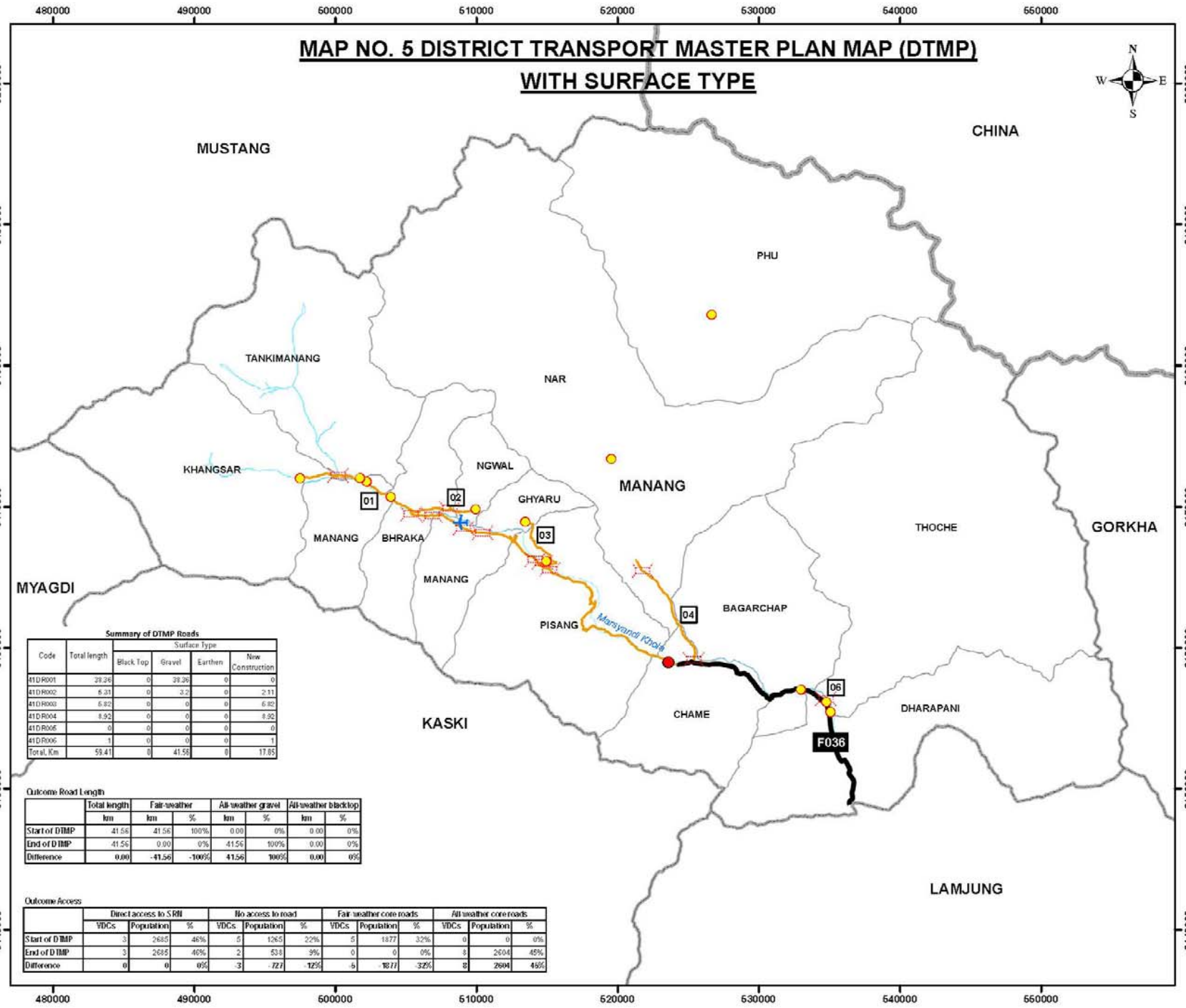
	Total length	Fair-weather		All-weather gravel		All-weather blacktop	
	km	km	%	km	%	km	%
Start of DTMP	41.56	41.56	100%	-	0%	-	0%
End of DTMP	41.56	-	0%	41.56	100%	-	0%
Difference	-	-41.56	-100%	41.56	100%	-	0%

The number of VDC headquarters with access to the SRN or all-weather DRCN roads will increase from 3 to 11 and the district population with access to the SRN or all-weather DRCN roads will increase from 46% to 91%. The number of VDC headquarters with no access to DRCN roads will remain at 2, while the percentage of the district population with no access to DRCN roads will remain at 9%.

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	3	2,685	46%	5	1,877	32%	0	-	0%	5	1,265	22%
End of DTMP	3	2,685	46%	0	-	0%	8	2,604	45%	2	538	9%
Difference	-	-	-	-5	-1,877	-32%	8	2,604	45%	-3.00	-727	-12%

MAP NO. 5 DISTRICT TRANSPORT MASTER PLAN MAP (DTMP) WITH SURFACE TYPE



Summary of DTMP Roads

Code	Total length	Surface Type			
		Black Top	Gravel	Earthen	New Construction
41DR001	28.26	0	28.26	0	0
41DR002	6.31	0	3.2	0	2.11
41DR003	6.82	0	0	0	6.82
41DR004	8.92	0	0	0	8.92
41DR005	0	0	0	0	0
41DR006	1	0	0	0	1
Total, Km	59.41	0	41.56	0	17.85

Outcome Road Length

	Total length	Fair-weather		All-weather gravel		All-weather blacktop	
	km	km	%	km	%	km	%
Start of DTMP	41.56	41.56	100%	0.00	0%	0.00	0%
End of DTMP	41.56	0.00	0%	41.56	100%	0.00	0%
Difference	0.00	-41.56	-100%	41.56	100%	0.00	0%

Outcome Access

	Direct access to SRN			No access to road			Fair-weather core roads			All-weather core roads		
	VDCs	Population	%	VDCs	Population	%	VDCs	Population	%	VDCs	Population	%
Start of DTMP	3	2685	46%	5	1265	22%	5	1877	32%	0	0	0%
End of DTMP	3	2685	46%	2	538	9%	0	0	0%	8	2604	45%
Difference	0	0	0%	-3	-727	-12%	-5	-1877	-32%	8	2604	46%

Legend

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

Name of District	District Development Committee, Manang
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

0 1.5 3 6 9 12 KM

1:250,000

ANNEXES

ANNEX 1 TRAFFIC DATA

Code	Description	Total length (km)	Motor-cycle	Car-Jeep-Minibus	Tractor	Truck-Bus	PCU
41DR001	F036(Chame)- Khansar Road	38.36	10	0	0	0	5
41DR002	Mugje Ngwal Road	3.2	3	0	0	0	2
Total		**41.56**					

ANNEX 2 POPULATION SERVED

	VDC	Population	DRCN roads						SRN
			41DR001	41DR002	41DR003	41DR004	41DR005	41DR006	
1	Bhraka	306	X	X					
2	Chame	1,129	X			X			X
3	Dharapani	1,012						X	X
4	Phu	176					X		
5	Ghyaru	71			X				
6	Khangsar	257	X						
7	Manang	630	X						
8	Nar	362				X	X		
9	Ngawal	274		X					
10	Pisang	307	X		X				
11	Bagarchhap	544							X
12	Tanki Manang	377	X						
13	Thoche	382						X	
	Total population	**5,827**	3,006	580	378	1,491	538	1,394	2,685
	Total VDCs/municipalities	**13**	**6**	**2**	**2**	**2**	**2**	**2**	**3**

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)
41DR001	F036(Chame)- Khansar Road	38.36	0+000	38+360		38.36		40	285	8		121			1376	500
41DR002	Mugje Ngwal Road	3.2	0+000	3+200		3.2			10							
Total		**41.56**			**0**	**41.56**	**0**	**40**	**295**	**8**	**0**	**121**	**0**	**0**	**1376**	**500**

ANNEX 4 APPROVAL LETTERS

नेपाल सरकार
संघिय मामिला तथा स्थानीय विकास मन्त्रालय
जिल्ला विकास समितिको कार्यालय
मनाङ

मिति २०७०।३।२१

प.सं. २०६९/२०७०
च.नं. १००३

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 / GOEC Nepal (P) Ltd. काठमाण्डौ विच मनाङ जिल्लाको यातायात गुरुयोजना तयार गर्नका लागि भएको सम्झौता बमोजिम मिति २०७०।३।२१ गते जि.वि.स. मनाङ कार्यशाला गोष्ठीमा यस जिल्लाका राजनैतिक दल एवं प्रतिनिधि, जि.वि.स. जिल्ला प्राविधिक कार्यालय र अन्य सरोकारवालाहरुको विचमा विस्तृत छलफल पश्चात यस जिल्लाको यातायात गुरुयोजना पारित भएको व्यहोरा जानकारीका लागि अनुरोध गरिन्छ ।

प्रेमराज गिरी
स्थानीय विकास अधिकारी

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 Eart

ANNEX 6 PHOTOGRAPHS

Photo 1 Workshop for DTMP Manang

Photo 2 VDC Headquarter, Ghyaru