ROYAL GOVERNMENT OF CAMBODIA

Ministry of Rural Development

Strategic Plan for Rural Roads

Draft Final (June 2007)

Contents

Foreword

This strategic plan has been prepared by a Working Group established by the Minister of Rural Development in September 2005.The Working Group comprised:

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The Working Group has been supported by consultants funded by DFID under its South East Asia Community Access Programme (SEACAP), who have facilitated the process. The consultants were: Mr Var Synarong, KCEC Ltd., Mr Farhad Ahmed, ITT Ltd, UK, and Mr David Stafford, OPM Ltd., UK. The MRD is grateful to DFID for its support. However, the views expressed in this report do not necessarily represent the views of DFID.

The purpose of this strategic plan is to develop a coherent national strategy for the improvement and maintenance of rural roads, which can provide a framework for future investment in the sector by both the RGC and donors.

The plan has been prepared in a phased process in consultation with stakeholders at particular stages.

An Interim Strategic Plan was produced in September 2006, which included as a top priority the updating of a government Policy for rural roads. A draft Policy was prepared in the first quarter of 2007, following which the Interim Strategic Plan has been reviewed to ensure consistency with the draft Policy. This final version of the Strategic Plan retains the main analytical work in the Interim Plan (which was carried out in 2006), but has been amended for consistency with the draft Policy, and has been updated to reflect developments since 2006.

Abbreviations

ADB	Asian Development Bank
ADT	Average Daily Traffic `
C&C	Communication and Coordination
C/S	Commune/Sangkat
CC	Commune Council
CMDG	Cambodia Millennium Development Goal
CREAM	Cambodia Rural Roads Economic Appraisal Model
CSES	Cambodia Socio-economic Survey
D&D	Decentralisation and de-concentration
DFID	Department for International Development
DORD	District Office of Rural Development
DRR	Department of Rural Roads
FRMR	Fund for Repair and Maintenance of Roads
GDP	Gross Domestic Product
GNI	Gross National Income
GPS	Geographic Positioning System
HCI	(Poverty) Head Count Index
HDI	Human Development Index
HRD	Human Resource Development
IEE	Initial Environmental Examination
ILO	International Labour Organization
IRAP	Integrated Rural Accessibility Planning
km	Kilometre
LBAT	Labour-Based Appropriate Technology
MDG	Millennium Development Goal
MEF	Ministry of Economy and Finance
MoI	Ministry of Interior
MoP	Ministry of Planning
MPWT	Ministry of Public Works and Transport
MRD	Ministry of Rural Development
NCDD	National Committee for D&D Reform
NIS	National Institute of Statistics
NPRS	National Poverty Reduction Strategy
NRDP	Northwestern Rural Development Project
NSDP	National Strategic Development Plan
PDRD	Provincial Department of Rural Development
PED	Provincial Environmental Department
PGI	Poverty Gap Index
PIP	Public Investment Program
PORR	Provincial Office of Rural Roads
PRIP	Provincial Rural Infrastructure Project
PSI	Poverty Severity Index
RED	Road Economic Development
RGC	Royal Government of Cambodia
RIIP	Rural Infrastructure Improvement Project
ROMAPS	Road Maintenance Management and Planning Systems
RRC	Royal Railways of Cambodia
RRMI	Rural Road Maintenance Initiative

RWT	Rural water transport
SEACAP	South East Asia Community Access Programme
SEDP	Social and Economic Development Plan
SIDA	Sweden's International Development Agency
SME	Small and Medium Enterprise
ST	Sub-tertiary
TA	Technical Assistance
TGA	Training Gap Analysis
TNA	Training Need Assessment
TRIP	Tertiary Rural Infrastructure Programme
UXO	Unexploded ordnance
UNDP	United Nations Development Program
WB	World Bank

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Currency Equivalents (as of April 30, 2007)

1 US$ = Approx. 3,980 Cambodian Riels
1 €= Approx 5,430 Cambodian Riels
1 UK£ = Approx. 7,960 Cambodian Riels

Map of Cambodia

EXECUTIVE SUMMARY

The purpose of the rural roads strategic plan is to set out the long-term direction and framework for rural road development and management in Cambodia, so that there is a consistent and unified approach to the planning, improvement and maintenance of rural roads. The contents of this document are designed to provide a secure basis on which MRD can strengthen its capability to plan, design, maintain and manage rural roads in a sustainable way; and the RGC and donors can determine appropriate and complementary funding and other support for the sub-sector.

Cambodia is a poor country with a per capita GNI of US$ 320, and poverty is pervasive. Approximately 90% of the Cambodian population (12 million) live in rural areas, and poverty reduction in the country will largely depend on the reduction of rural poverty and inequality.

There is overwhelming evidence that the provision of rural roads is a critical factor in reducing poverty in rural areas. Most rural roads in Cambodia (about five sixths) are in a poor condition, and rural households face a considerable transport burden. Rural road improvement will help to reduce this burden, and improve the socio-economic wellbeing of the rural population. Economic evaluations of rural road projects in Cambodia indicate high economic internal rates of return, and rural road investments can contribute to the achievement of a number of the Cambodia Millennium Development Goals.

The overall objective of this strategic plan is to contribute to:

Improve social and economic conditions of rural Cambodia, with an emphasis on improving the livelihoods of the rural poor and creating livelihood opportunities for women in rural areas, through the sustainable improvement and maintenance of rural roads.

Four categories of issues have been identified as critical to the achievement of this objective: programming and planning issues (which set the framework); financing issues (based on requirements and estimates of the resources likely to be available); sustainability issues (addressing technical and practical issues in the development and maintenance of rural roads); and institutional issues (institutional strengthening and human resource development). Strategic options have been developed for resolving each of the various issues identified in these four categories. This is followed by an action plan for implementing the chosen options, which includes a time frame and the identification of the responsible parties, including areas where donor assistance is required.

The main targets in this strategic plan are to bring all the rural roads up to maintainable standards within 20 years in a phased manner. The specific targets for each category of road are 7, 10, 15 and 20 years for Tertiary (T), Sub-tertiary Type 1 (ST 1), Sub-tertiary Type 2 (ST 2), and Sub-tertiary Type 3 (ST 3) roads respectively.

The average per year development and maintenance costs over the next 10 years (2007-16), which are consistent with these targets, are estimated at roughly US$ 31 million in 2006 prices. This annual figure compares with an estimated expenditure on rural roads in 2005 of around US$ 20 million. The annual figure of US$ 31 million comprises 56% for development and improvement, and 44% for maintenance. About

46% of the total amount would be required by MRD/PDRD for T and ST1 roads, and the Commune Councils would require the remaining 54% for ST2 and ST3 roads.

Estimates of available resources over the period from ongoing projects and programmes suggest that approximately 45% of the US$ 31 million required per year would be available. Therefore the additional amount that needs to be mobilised averages US$ 17 million per year between 2007-16. The funding gap for T and ST1 roads is lower than the funding gap for ST2 and ST3 roads: US$ 6.7 million against US$ 10.3 million respectively.

The seven most important issues addressed in this strategic plan are summarised below in order of priority, together with a summary of the proposed strategy for addressing the issue.

1. Adoption of the draft Policy for Rural Roads by the RGC as official government policy.
   MRD will submit the draft rural roads policy to the Council of Ministers for its consideration and subsequent approval.

2. Development of a comprehensive road Inventory supported by spatial data:
   Since a road inventory is one of the fundamental requirements for any sensible road planning system, MRD will start immediately the development of a complete rural infrastructure inventory, including roads, building on experience recently gained from an ADB assisted project.

3. Developing an appropriate planning system including an appropriate method for prioritising and targeting road investments to reduce rural poverty and to promote the social and economic development of rural Cambodia:
   MRD will encourage capital investment in poorer provinces to maximise the investment impacts on the rural poor. A priority list of provinces has been developed to guide future capital investment. A road prioritisation methodology that takes into consideration the economic and social benefits of rural roads investment will be developed and made operational at different levels. Further, a simplified system for maintenance prioritisation will be developed.

4. Clear and comprehensive guidelines to address technical and other issues that are related to rural road development and maintenance:
   MRD will develop guidance on a number of issues linked to the technical, social and environmental aspects of rural road improvements including appropriate road surfacing, the use of appropriate technology for roadworks, rural roads and rural water transport complementarity, and rural road standards.

5. Development of a comprehensive maintenance system that supports asset preservation:
   MRD will implement a simple basic maintenance management system on a priority basis, trialling the system in a number of provinces and then moving progressively towards a more sophisticated system.

6. Provision of appropriate resources for development and maintenance:

   More emphasis will be placed on maintaining and adding asset value to the rural road network. MRD will seek increased maintenance funding from the government, and increased donor support to supplement the RGC's efforts.

7. Setting up appropriate communication and coordination mechanisms within MRD and between MRD and main stakeholders:

   MRD will seek to facilitate more effective communication and coordination within MRD, between MRD headquarters and its field offices, between MRD and CCs, between MRD and other ministries and between MRD and donors.

CHAPTER 1

CONTEXT AND BACKGROUND

1.1 Background, Socio-economic Conditions, Poverty Situation and Development Context of Cambodia

Demography: Cambodia's population in 2003 was 13.77 million (NIS, 2003). With a land area of 181,035 sq km, this represents a population density of 76 persons per sq km. The population density is lower than two of her neighbours, Thailand (122 persons per sq km) and Vietnam (252 persons per sq km), but higher than the other neighbour, Laos (25 persons per sq km). The population of Cambodia is increasing at a rate of 2.5% per annum – comparatively higher than its neighbours: Thailand (0.7%), Vietnam (1.1%) and Laos (2.3%). It is estimated that the total population will grow to 18.5 million by 2016. The 1998 population census suggests that an overwhelming majority (approximately 90%) of the Cambodian population lives in rural areas (NIS, 2003); implying that roughly 12 million Cambodians live in rural areas.

Macro-economy and its composition: In 2004 Cambodia had a Gross National Income (GNI) of US$ 4.4 billion representing a per capita GNI of US$ 320. This is lower than the average of all low income countries, US$ 510 per capita, and substantially lower than the East Asia and Pacific average of US$ 1,280 per capita. The Cambodian economy is still noticeably dependent on agriculture: the agriculture sector's share in the Gross Domestic Product (GDP) is 36% against industry and service sector shares of 28% and 37% respectively. The agriculture sector share is high compared with the average figures for low income countries (23%) and countries in East Asia and Pacific (15%).

Macroeconomic indicators suggest that the Cambodian economy has performed well in the last few years: the economy grew at 7% in 2003, 7.7% in 2004 and the 2005 estimate is over 6%. The rates of inflation have remained low since 1999: the average annual rate of inflation between 2002 and 2004 was 2.75%.

Poverty, inequality and human development: Poverty in Cambodia is pervasive and multi-dimensional. The poor face a number of interlocking and mutually reinforcing problems including low income and consumption, poor nutritional status, low educational attainment, low access to public services including school and health services, low access to economic opportunities, vulnerability to external shocks, and exclusion from economic, social and political processes. The Human Development Index (HDI) value for Cambodia is 0.571 – this ranks Cambodia at 130 among 177 countries. The present Cambodian HDI figure is not noticeably different from the worst performer in East Asia and Pacific (Timor-Leste with an HDI value of 0.513) and Cambodia's own 1995 figure of 0.533.

A 1997 survey showed that a third of the population (36.1%) lives below the official poverty line. However, a more recent poverty study concluded that the proportion of population living below the poverty line, often referred to as the poverty headcount index (HCI), has decreased from 39% in 1993/94 to 28% in 2004 (Knowles, 2005; World Bank 2005). Over the same period the Poverty Gap Index (PGI)[1] based on the

[1] PGI indicates the percentage of total household consumption that would be needed to be redistributed with perfect targeting to eliminate poverty.

overall poverty line reduced from 9.21 to 9.02. The inequality of poverty measured by the Poverty Severity Index (PSI[2]) has also reduced - by 24% from 3.11 in 1993/94 to 2.35 in 2004 (Knowles, 2005).

Approximately 91% of Cambodia's poor live in rural areas (World Bank, 2005). In addition, rural poverty is more severe than urban poverty (the HCIs for rural and urban Cambodia are 34% and 22% respectively), and the rate of reduction of poverty in rural areas is lower than that of urban areas (the HCI in rural areas fell by a fifth between 1993/4 and 2004, while the HCI in urban areas, excluding Phnom Penh, fell by a third). Another disturbing aspect is that the overall inequality in rural areas has increased between 1993/94 and 2004, while it has improved a little in urban areas (the Gini Coefficient increased from 0.27 to 0.33 in rural areas, and reduced from 0.39 to 0.37 in Phnom Penh and from 0.439 to 0.437 in other urban areas)

The analysis above indicates that the issue of poverty in Cambodia is essentially that of rural livelihoods. In order to have a profound impact on poverty in Cambodia it is necessary to achieve higher and equitable rural growth.

Poverty reduction policy and strategy: At the end of the 1990s Cambodia launched a three pronged strategic agenda for sustainable development including the promotion of economic and social development through the implementation of a reform programme. The rapid reduction of poverty was perceived to be an integral part of the strategy. The Royal Government of Cambodia (RGC) has set out a vision to achieve a socially cohesive, educated and culturally vibrant Cambodia without hunger, illiteracy and ill health. The National Poverty Reduction Strategy (NPRS) and Socio-economic Development Plan (2001-05), SEDPII, were adopted to achieve this vision. RGC has prepared a new draft five-year development plan, the National Strategic Development Plan (NSDP) 2006-10, as a follow-up to SEDPII. NSDP is considered to be the single reference document for pursing prioritised goals, targets and actions for RGC. The NSDP takes into consideration the main changes that took place since the start of SEDPII in early 2001 including the development of the Cambodia Millennium Development Goals (CMDGs) following the UN Millennium Summit in 2000, and the adoption of the "Rectangular Strategy" for growth, employment, equity and efficiency by RGC.

1.2 Transport Sector Policies and Strategies

National transport policy: A draft national transport policy has recently been published by the Ministry of Public Works and Transport (MPWT). The draft policy contains a series of statements, and is a follow-up step to the 2002 transport sector strategy. The main emphases of the transport sector policy are to link transport sector investments with poverty alleviation, to make provision for adequate maintenance funds for sustainable sector development, and to encourage private sector involvement. Steps are being taken for the approval of the draft transport policy.

Rural road Policy: A draft rural road policy was first produced in 1999 and updated in 2002, primarily to accommodate legal and institutional changes that had taken place as a result of the early-2002 Commune Council elections. The policy remained as a draft. Following the preparation of an interim version of this Strategic Plan in 2006, the policy has been further updated. The current draft policy identifies 21 issues, and sets out, in relation to each issue, the objective, context, and policy direction. This

[2] This index provides more weight to very poor than to less poor.

final version of the Strategic Plan elaborates how the policy directions will be implemented, and is fully aligned with the draft policy.

Transport sector strategy: MPWT published a transport sector strategy report in 2002. The objective was to develop national transport sector policy and individual modal and sub-sector strategies aimed at promoting national economic growth and poverty alleviation. The report's policy statements have become the draft transport policy. The report recommended a series of strategies for different sub-sectors that dealt with different issues including the rate of improvement of the road network, road maintenance, transport planning, maintenance financing, regulatory framework, and institutional strengthening. However, the transport sector strategy has never been formally approved.

1.3 Transport Sector Structure and Stakeholders

The transport sector in Cambodia comprises roads, railways, inland water and air transport. The shares of passenger and cargo transported by road far outweigh the shares by other modes.

Roads: Roads in Cambodia are divided into four broad categories: national, provincial, tertiary and sub-tertiary roads, and there are three categories of sub-tertiary roads. While the MPWT is responsible for the National and the Provincial roads, the MRD is responsible for the Tertiary and Sub-tertiary roads. Table 1 provides the road classification and division of responsibilities.

Table 1: Cambodia Road Classification and Division of Responsibilities

Type	Definition	Responsibility
National Roads	▪ Roads that connect the capital to the main international border crossings and/or provincial capitals.	MPWT
Provincial Roads	Roads that connect: ▪ District centres to provincial centres or to primary roads ▪ A provincial centre to another adjacent provincial centre ▪ Industrial, commercial, tourist and other centres that have large transport needs	MPWT
Tertiary Roads (T roads)	▪ District to district roads	MRD
Sub-tertiary Roads: Sub-tertiary Road Type 1 (ST1 roads) Sub-tertiary Road Type 2 (ST2 roads) Sub-tertiary Road Type 3 (ST3 roads)	▪ District to commune ▪ Commune to commune ▪ Commune to village or village to village	MRD

There are also other ministries that have road related responsibilities. They include the Ministry of Economy and Finance (for administering the national budget and maintaining the national accounts), the Ministry of Planning (for national development planning and statistics), the Ministry of Environment (for environmental protection and related standards), the Ministry of Interior (for enforcement of traffic regulation through the police), and the Ministry of Land Management, Urban Planning and Construction (for land management, urban planning and regulating and building urban infrastructure).

Railways, air and inland water transport: The inland waterway system (IWS) plays an important role in the movement of freight and passengers in Cambodia. There is no reliable data available on the extent of the freight and passengers moved by IWS. However, its importance can be considered second to road transport. The total navigable waterway length is 1,750 km. Only a third of this length (580 km) is navigable year round (World Bank, 2004). The system consists of the Mekong River and its tributaries, the Tonle Sap Lake and its tributaries, the Tonle Sap River, and the Bassac River. The Mekong River, Tonle Sap and Bassac rivers account for approximately a half of the navigable inland waterway length.

Railways play a minor role in the transport sector. Royal Railways of Cambodia (RRC) is a state owned enterprise under MPWT. RRC has two lines (totalling approximately 600 km): the southern line from Phnom Penh to the port city of Sihanoukville (265 km) and the northern line between Phnom Penh and Sisophon (337 km), near the Thai border. While the modal share of cargo transportation by railways is 5-7 percent, it is negligible in the case of passenger transportation. Air transport in Cambodia mainly carries passengers. Although the cargo movement by air has increased over time, it remains small, and constitutes less than 1 percent by weight of the Cambodia's international trade. MPWT carries the overall responsibility for the management and development of rail, air and inland water transport in Cambodia.

1.4 Role of Local Government Institutions

Cambodia is a unitary state as specified in Cambodia's constitution. The territory is divided into province/municipality, district/khan and commune/sangkat (C/S). There are 20 provinces, 4 municipalities, 171 districts, 14 khans, 1510 communes and 111 sangkats (RGC, 2005). Currently there are three levels of sub-national management systems: province/municipality, district/khan, C/S. The C/S councils were established by direct elections in early 2002. At the district/khan and province/municipality levels the departments and agencies execute policies/plans of the central line ministries or institutions following vertical lines. Given the lack of effective horizontal coordination the provinces and districts face many difficulties in managing development activities. Cambodia is in the early stage of its local government reforms, and the system is still evolving through the decentralisation and deconcentration (D&D) process.

The C/S organic law defines the functions of the C/Ss. The C/Ss prepare and implement budgets and plans. The law also stipulates that C/Ss can raise revenues locally, but so far the only revenue source of these local government bodies has been transfers from the centre through the C/S fund. In 2005 an average C/S received roughly US$9,700, of which a third is earmarked for administration and the remainder is for development of infrastructure. An overwhelming majority of the development fund is being spent on roads – a recent estimate mentioned a figure of roughly 80%. However, the project implementation capacity at the C/S level is very low, inter-C/S cooperation is yet to take place, and the nature of the relationships between C/S and province/municipality or district/khan is not yet defined.

A broader organic law covering the powers and functions of all levels of local government is currently in draft form. However, a Strategic Framework for D&D reforms was approved by the Council of Ministers in June 2005. RGC's vision is to create a unified system at the province/municipality and district/khan levels, and to strengthen and improve the already established C/S councils. It is envisaged that all

levels of local government will deliver infrastructure and socio-economic services, and that the C/S councils will assume more responsibilities in planning, budgeting and undertaking local development and providing basic public services. More financial resources are expected to be available at the C/S level through an increased C/S fund allocation, development of their own revenue base, and revenue sharing that they help to collect.

The RGC Seila Programme was approved by the Council of Ministers in 2001 to provide a framework for aid mobilisation and coordination in support of the implementation of D&D. The Seila Programme has been supported by various donor agencies, and implemented in collaboration with several partners including World Bank, DFID, Danida, SIDA, UNDP, IFAD, CIDA, USAID, and Unicef. In 2007 the Seila Programme was replaced by the National Committee for D&D Reform (NCDD), which is chaired by the Minister of Interior, and supported by a secretariat which is also under the Ministry of Interior. The donor supported programmes are broadly continuing within the new institutional structure through the Programme Support Team.

1.5 Supply of Road Infrastructure

Road transport plays an overwhelming part in the transportation of passengers and cargo in Cambodia. Cambodia's road network is approximately 38,500 kilometers (km), of which approximately 10,500 km are national roads and provincial roads under the responsibility of MPWT, and approximately 28,000 km are tertiary roads under the responsibility of MRD. Since mid-1990 there has been a major effort to improve the network. However, the road network is still in poor shape. A road condition survey in 2002 showed that only a fourth of the national and provincial road network was in good to fair condition at that time (Table 2).

Table 2: National and provincial road network

	Length (km)	**Good and fair (km)**	**Poor (km)**	**Bad (km)**
National roads	4,757	1,186	2,439	1,132
Provincial roads	5,700	1,291	2,426	1,983
Total	10,457	2,477	4,865	3,115
Percentage		**24%**	**47%**	**30%**

Source: World Bank (2004)

Data have been collected as part of the preparation of this strategic plan to establish best estimates of the conditions of different types of tertiary roads. The results are summarised in Table 3, with the details given in Appendix I. The data collection exercise covered approximately 24,000 km[3] of rural roads in Cambodia. About two-thirds are ST3 roads, the remainder being tertiary roads (8%), ST1 roads (11%) and ST2 roads (18%). About 84% of these rural roads are considered to be in poor to bad condition.

[3] This represents 86% of the total length of rural roads which is estimated at 28,000 kms.

Table 3: Rural Road Length by Type, Surfacing and Condition

Road Type	Length (km)	Road Surface		Condition	
		Laterite (km)	Earth (km)	Good to fair (km)	Poor to bad (km)
Tertiary	1,972	1,373	599	729	1,243
ST1	2,651	1,682	968	659	1,992
ST2	3,949	2,460	1,489	689	3,260
ST3	15,456	3,937	11,520	1,859	13,597
Total	**24,028**	**9,452**	**14,576**	**3,936**	**20,092**

Source: Department of Rural Roads (DRR) of MRD (Based on data collected by PDRDs from different provinces)

Table 4 gives the percentages, for length and conditions, by category of road. It shows that the proportion of the roads considered to be poor to bad increases steadily from 63% for tertiary roads to 88% for ST3 roads

Table 4: Estimated proportions of length and condition of different types of rural roads

	Length (km)	Good to fair (km)	Poor to bad (km)
Tertiary	8%	37%	63%
ST1	11%	25%	75%
ST2	17%	17%	83%
ST3	64%	12%	88%
Overall		**16%**	**84%**

1.6 Donor Support for Rural Roads

Since 1998 10 major foreign aided projects or programmes, have been implemented, or are being implemented, for rural roads improvement. The total value of these projects is approximately US$ 125 million (although part of this amount was disbursed before 1998). The details are given in Appendix II.

CHAPTER 2

INVESTMENT RATIONALE FOR RURAL ROADS

There are strong arguments for an increase in investment in rural roads in Cambodia. The following sections present the demand for rural transport in Cambodia including comparisons with some Asian and African countries; the links between rural road investments and poverty reduction; the economic rationale for such investments; and the connection between investment in rural roads and the achievement of the CMDGs.

2.1 Demand for Rural Transport

In the late 1980s and early 1990s a number of pioneering studies were conducted in rural areas of a number of Asian (Philippines and Bangladesh) and African (Zambia, Uganda, Burkina Faso, Tanzania and Ghana) countries to quantify the demand for rural transport and to establish the travel and transport characteristics of rural households (Dawson and Barwell, 1993; Ahmed 1995; IT Transport, 2000). The studies highlighted the heavy transport burden, in terms of time and effort spent on transport, faced by rural households in developing countries. The studies concluded that a considerable amount of time and effort were spent in providing for basic transport needs of households, which limited the extent to which households could take advantage of economic opportunities. The study results have been instrumental in shaping different country rural transport policies in subsequent years. It is now overwhelmingly acknowledged that there is a need to reduce the transport burden on rural households in developing countries in order to improve their overall welfare.

There have been two studies conducted in Cambodia, one in 2000 and another in 2002, that examined the transport demand and travel patterns in two rural districts in Siemreap Province. The Cambodian study results are shown in Table 5 with comparisons with some other Asian and African countries.

Table 5: Comparison of Transport Burden among Different Developing Countries

	Household Size	Trip (per day)	Time /day (hour)	Distance/day (km)	Transport-efforts (tonne-km) per year
Cambodia [2000]	5.8	16	6.7	23.1	66.8
Cambodia [2002]	5.9	12	6.4	22.9	16.2
Cambodia (overall)	5.8	15	6.7	23.1	58.4
Ethiopia	5.8	5	3.5	n/a	23.2
Philippines	5.3	6	2.4	n/a	63.8
Bangladesh	5.4	32	4.4	26	244

Source: Rozemuller et al. [2000; 2002); IT Transport (2000); Ahmed (1995);

Table 5 shows that the members of an average study household in Cambodia spend approximately 6.7 hours per day in order to satisfy travel and transport needs of the household. This figure is higher than comparable Ethiopia, Bangladesh and Philippines figures. The amount of time a Cambodian household spends on transport is close to the hours a full-time worker in a developed country spends on a job. Members of an average household in Cambodia travel just over 23 km per day to

satisfy household transport needs. This is slightly lower than the Bangladesh figure of 26 km. However, a substantial portion of this distance is covered on foot and on poor roads. Although the transport efforts made by an average Cambodian household (roughly 58 tonne-km per year) is substantially lower than an average rural Bangladesh household, it is slightly lower than the Philippines figure. However, it is considerably higher than the Ethiopia figure.

The Cambodian studies however point out some positive aspects of the rural travel and transport situation: (i) men and women share almost equally the transport burden (e.g. Rozemuller et al. (2002) found that the time spent on transport and the distance travelled by men and women are similar); (ii) the transport mode ownership is considerable in rural areas (e.g. about 70% of the households in two villages in Siemreap Province have at least a bicycle).

The earlier paragraphs show that the transport burden on households in rural Cambodia is substantial. An improved rural road network would play an important role in reducing this burden, and thereby improving the welfare of rural people. The potential benefits are discussed later in relation to the CMDGs.

2.2 Rural Transport and Poverty Reduction

A number of recent studies conducted in different parts of the world have found positive links between the development of road infrastructure and poverty reduction (Kwon, 2000; Balisacan, Pernia, and Asra, 2002; Jalan and Ravallion 2002; Glewwe et al. 2000; Van de Walle and Cratty 2002; Jacoby 1998, Aguma 2005; Fan S & Chan-Kang C, 2005). The links seem to be most emphatic in the case of rural roads.

A recent study in Uganda (Aguma, 2005) concluded that the government's expenditure on rural roads was the most powerful determinant of the reduction of poverty in rural areas. Poverty reduction elasticity of rural road investment quoted by the study is -0.1 (i.e. a one per cent increase in government expenditure on rural roads decreases the poverty index by 0.1 per cent).

There is also compelling evidence from South, East and South-East Asia on the links between investment in rural roads and poverty reduction. The most significant finding of a recent study in China is that lower order (mostly rural) roads have approximately four times greater benefit–cost ratios than higher order roads (Fan & Chan-Kang, 2005). The study also concluded that investments in low-quality roads have considerably higher potential for raising poor people out of poverty than their high-quality counterparts thereby creating a win-win strategy for growth and poverty alleviation. Jalan and Ravallion (1998) found that in rural China road density was one of the significant determinants of the probability of a household escaping poverty. A study in Vietnam concluded that a road in a village increased the probability of households breaking out of poverty, and that this probability was higher for households in poorer provinces than better-off provinces (Deolalikar, 2001). Other Vietnam studies suggest that poor households living in rural communes with paved roads have a higher probability of escaping poverty than those in communes without paved roads (Glewwe et al. 2000); and that the strongest positive impact of rural roads investment was on the poorest households (Van de Walle and Cratty 2002).

No studies have been conducted in Cambodia to examine the statistical links between investment in rural roads and poverty reduction, but there have been a number of studies (Sakko 1999, TRIP, 2004; TRIP 2002, MRD, 2002) that looked into the impact of rural roads on the overall socio-economic wellbeing of rural people, an

overwhelming majority of whom are poor. Two studies (TRIP, 2002; TRIP, 2004) reported a rise in income levels of rural households, and the creation of more income generating opportunities, after the construction of rural roads. Rehabilitation of rural roads has also created direct employment opportunities for the unemployed local labourers. Conclusions from another study (MRD, 2002) conducted under the Asian Development Bank assisted Rural Infrastructure Improvement Project (RIIP) produced similar results. Evidence also suggests a significant increase in non-farm activities (e.g. the opening of roadside shops) following road improvements (MRD, 2002).

2.3 Economic Rationale for Investment

There is overwhelming evidence from Cambodia that rural road investment yields high economic returns using conventional economic evaluation methods.

MRD (2002) has estimated the economic rate of return of 37 rural roads developed under the ADB assisted RIIP project. The average Economic Internal Rate of Return (EIRR) was 48%. A more recent study estimated an overall EIRR of 33% for eight roads developed under the C/S fund (MRD and Seila, 2004). An estimate of the distribution of benefits among road users showed that a fourth of the benefits went to pedestrians. A study by Abrams (2004), that conducted an economic evaluation of small scale rural infrastructure projects implemented under the C/S fund, concluded that the Commune Council implemented rural road projects had an EIRR of 25%.

2.4 Rural Roads and Millennium Development Goals

The Millennium Development Goals (MDGs) have become a central feature in international development policy. The importance of transport infrastructure in the achievement of the MDGs has been emphasised in several recently published reports (Sachs, 2005; Commission of the European Communities, 2005; World Bank, 2003).

There are nine CMDGs compared to the eight internationally accepted MDGs. The ninth CMDG relates to de-mining, unexploded ordnance (UXO) and victim assistance. Figure 1 illustrates the strength of the potential linkages between rural transport/roads and the achievements of CMDGs. The following paragraphs describe the direct and indirect links shown in Figure 1, and Appendix III gives a more detailed analysis for all the CMDGs.

CMDG 1 - eradicate extreme poverty and hunger: Cambodia has established eight indicators to assess the achievement of CMDG 1 including a reduction in the proportion of people below the national and food poverty lines, and equity in consumption. Section 2.2 presented evidence from a number of international studies that directly link investment in rural roads and a reduction in poverty and inequality. The links work through providing the rural poor with greater access to markets and employment opportunities. Rural roads also reduce transport costs and improve market access for enterprises and service providers, bringing further indirect benefits.

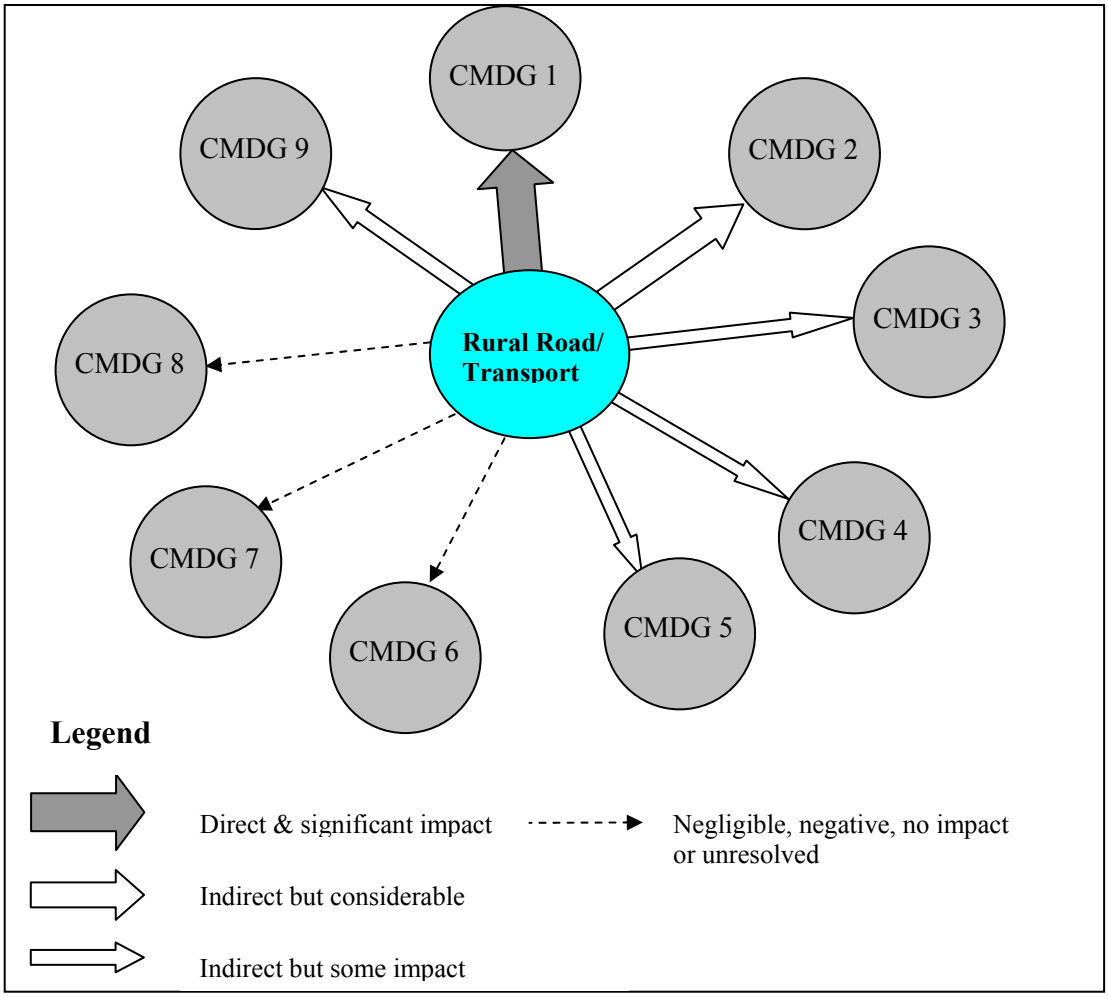

Figure 1: Rural road/transport investments & achievement of CMDGs

CMDG 2 - universal primary education: There are ten indicators to assess CMDG 2 including an increase in net enrolment rates and ratios, and increases in the ratios of girls to boys in primary and secondary education. International and Cambodian evidence has established substantial links between rural roads development and increases in enrolment rates for both boys and girls by improving the accessibility of schools for rural people (Doeolalikar, 2001; TRIP, 2002, TRIP, 2004).

CMDG 3 - gender equality and empower women: CMDG 3 has twenty indicators that range from the ratio of girls in upper secondary schools to the proportion of female Ministers. The worst performing indicators include the ratio of females in tertiary education, the ratio of illiteracy among females of different age groups, and the female share in wage employment in services. Empirical evidence from Cambodia and Vietnam suggest a positive link between rural road development and the achievement of some of the indicators connected to this goal, especially by extending the travel horizon of women, increased school enrolment of girls, and increased interactions between women and government and NGO workers (Doeolalikar, 2001; TRIP, 2002, TRIP, 2004).

CMDG 4 & 5 – reduce child mortality, improve maternal health: A total of seven and nine indicators have been established to assess CMDG 4 and 5 respectively. Although the CMDG 4 indicators have either been achieved or are on target, there are a number of under-achieving CMDG 5 indicators including an indicator related to

ante-natal care consultation from skilled health personnel. Empirical study results from Cambodia and other countries suggest that improved rural road increases access to health facilities and hence their usage, especially by women, and also results in more frequent visits by health workers ((Doeolalikar, 2001; DFR, 2006; Trip, 2002). Therefore, an improved rural road network would help in the achievement of some of the worst performing indicators of CMDG 5.

CMDG 6 – combat HIV/AIDS, malaria and other diseases: There are 17 indicators to assess CMDG 6. A MoP (2005) assessment suggests that the achievement rates are good but still below targets. Although improved transport infrastructure can bring many economic and social benefits, they may also be responsible for the spread of infectious diseases, including HIV/AIDS. However, careful planning and implementation of mitigating measures will help offset such risks. Improved rural roads could contribute to increased awareness among rural residents, resulting from increased training activities of the government and NGO workers and increased access to public health facilities.

CMDG 7, CMDG 9 - ensure environmental sustainability; de-mining, UXO and victim assistance: CMDG 7 has eight indicators. One of the poorly performing indicators is the fuel wood dependency of households; rural road improvement may help in the achievement of this indicator due to the increased access to alternative energy sources by the villages. However, rural road improvement may also be associated with environmental degradation (e.g. loss of agricultural land or felling of trees), although MRD and Seila (2004) reported that rural road construction did not have any significant negative environmental impacts. Improved rural roads may help in the achievement of CMDG 9 by facilitating personnel and equipment access to remote areas with mines.

CHAPTER 3

STRATEGIC OBJECTIVES, ISSUES AND THE PLAN DEVELOPMENT PROCESS

The next sections elaborate the strategic objective of the plan, the issues that are linked to the achievement of the strategic objective, and the approach taken in selecting the strategic options in the plan.

3.1 The Strategic Objective & Guiding Principles

The first step in the development of the strategic plan was the establishment of its strategic objective, together with the identification of general principles that served as a basis for decision making during the process of development. The strategic objective is to:

> *"Improve social and economic conditions of rural Cambodia, with an emphasis on improving the livelihoods of the rural poor and creating livelihood opportunities for women in rural areas, through the sustainable improvement and maintenance of rural roads."*

The guiding principles adopted in the process of developing the specific strategies were:

(i) Maintaining continuity and making optimum use of the experience already gained in the sub-sector;

(ii) Development of the strategy in line with the RGC's D&D policy;

(iii) Increasing the synergy between rural and other types of roads;

(iv) Cautious and progressive adaptation of modern technological options, so that the chosen options (a) maximise the benefits to the poor, (b) are not burdensome on the current institutional set-up, and (c) facilitate the development, maintenance and management of rural roads.

3.2 Issues

Four categories of issues have been identified as critical in achieving the objective set out above: programming and planning; financing; sustainability; and institutions. These issues are inter-related:

- **Programming and planning** sets the framework for achieving the objective;
- **Financing** provides the major determinant for establishing realistic targets;
- **Sustainability** addresses the technical and practical issues in the development and maintenance of rural roads;
- **Institutions** addresses the institutional arrangements and capacity for effective delivery.

The specific issues identified under each of these four categories are presented below. The problems related to these issues were treated as the root problems in the sustainable development and maintenance of rural roads. Appendix IV presents the

causal links between the issue related problems and the achievement of the strategic objective.

Issue Category	Issues
Programming and planning	• Road law and rural road policy. • Road Inventory and road management information system. • Geographic targeting of rural road investment. • Road prioritisation and standard tool for road prioritisation. • Rural roads and rural water transport complementarity. • Rural road standards • Rural transport services. • Participation of women in roadworks • Roadworks and environmental sustainability • Road safety • Rural roads and risks of spreading HIV/AIDS • Stakeholder participation
Financing	• Potential rate of network improvement and the funding requirements • Available funding and funding gaps
Sustainability	• Development of sustainable maintenance management system • Control of vehicle overloading • Involvement of private sector in road development and maintenance • Application of labour-based technology in roadworks • Surfacing of rural roads • Monitoring and evaluation of rural road projects
Institutions	• Institutional strengthening • Staff development • Communication and coordination

3.3 Approach to Selection of Strategic Options

The next step in developing this plan was to identify mutually exclusive strategic options for addressing the various issues listed above. The best options were then selected after careful consideration of the advantages and disadvantages linked to each of the options, drawing on the Guiding Principles in Section 3.1 above. This selection process also took account of the various barriers to the achievement of each option under four headings: financial, institutional, legal and technological. The options are discussed in the following chapters, and Appendix V summarises the reasons for the selection of each option. Finally an action plan was developed for each of the selected options. The action plan details the actions, responsibilities, time frame and indicators linked to each selected strategic option.

3.4 Structure of the Next Chapters

The rest of this plan has five chapters. Chapters 4 to 7 analyse the issues identified under each of the four categories. Each issue is elaborated, followed by the identification of the options for addressing the issue and the barriers associated with the options, and the selection of the best option.

Chapter 8 summarises the selected strategies in an action plan for implementation.

CHAPTER 4

PROGRAMMING AND PLANNING OF RURAL ROADS

This chapter presents the issues related to the programming and planning of rural roads that set the framework for the achievement of the strategic objective. The issues are:

(i) The **legislative and policy framework**, or more specifically the Road Law, and transport and road policies;

(ii) **Road inventory** that is a basic requirement for any meaningful planning;

(iii) **Investment prioritisation** including geographical targeting, and the choice of prioritisation tool;

(iv) **Policies on technical issues** that include complementarity with rural water transport, rural road standards, and provision of transport services;

(v) **Policies on social and environmental issues** that include employment opportunities for women from roadworks, environmentally sustainable road intervention, road safety, HIV/AIDS, and stakeholder participation.

4.1 Legislative and Policy Framework

The Road Law

There is a draft Road Law. The law has several objectives including providing a legal framework to plan, maintain, improve and extend the road networks, classifying public roads, and facilitating the management of such networks at different levels of government. It defines the responsibilities, obligations, rights and interests of the State, the communities, individuals and users of public roads.

The draft Road Law provides a number of responsibilities for MPWT including policy development, coordination for equitable and efficient resource allocation and regulation of the road transport sector. MPWT also holds the road classification responsibilities.

MRD is designated as a road authority in the draft law, where it is responsible for the planning, design, development, maintenance and management of rural roads. The draft law provides MRD with powers in a number of areas including setting operational priorities with regard to the development and maintenance of rural roads, preparation of annual budgets for rural roads, ensuring compliance with all technical, labour, environmental and safety standards related to rural roads, and maintaining an inventory on rural roads and traffic conditions.

The draft Road Law has been discussed in various workshops and among stakeholders, and has been submitted to the Council of Ministers for approval. After approval by the Council of Ministers it will be sent to the parliament.

Transport policy

As mentioned in chapter 1 MPWT has recently published a draft national transport policy. A series of policy statements are presented in two groups – general statements and mode-specific statements. The draft transport policy specifically mentions the policy of using economic criteria in investment decisions, encouraging private sector involvement in the sector, linking transport sector investments with poverty

alleviation, and the provision of adequate maintenance funds for sustainable development of the sector.

There is one policy statement that is specifically connected to rural roads, namely the link between the provision of all weather rural roads and poverty eradication which is stated as one of the priorities of the RGC. The statement also mentions the policy of continuous review of rural road funding, and the establishment of a high-level liaison committee so that MRD could profit from the experience of MPWT in terms of road design, road construction and maintenance.

Policy for rural roads

Chapter 1 also refers to the draft rural road policy, which has been updated in the first part of 2007, in consultation with stakeholders. There is now the need to seek approval of the policy from the Council of Ministers so that there is an official RGC policy on rural roads.

Options considered, preferred option and barriers: two options were considered in relation to this issue: **Option 1**: taking immediate steps to seek Council of Ministers' approval for the draft rural roads policy, and to liaise with MPWT to seek the approval of the draft Road Law; **Option 2**: delaying the submission of the draft policy to the Council of Ministers so that the policy can be refined further.

Option 1 is the preferred option (see Appendix V). The potential level of barriers in the implementation of option 1 is assessed as:

Financial **Low**; Institutional: **Low;** Legal: **High** and Technological: **low**.

4.2 Road Inventory

A reliable road inventory plays a crucial role in the development of an effective road planning and management system. Currently, there is no nation-wide inventory of rural roads in Cambodia, but there has been significant progress in some areas of the country. MRD has recently completed (end-2006) an ADB funded project, the IRAP/GIS project, which supported the IRAP component of the Northwestern Rural Development Project (NRDP). The IRAP/GIS project had two objectives: to institutionalise IRAP and GIS applications at the national level, and to build capacity for IRAP applications at the provincial level. The project was implemented by ILO. The project has helped to develop IRAP/GIS capacities at the national level and in four project provinces – Battambang, Siemreap, Banteay Meanchey and Oddar Meanchey.

Detailed inventories of the rural infrastructure, including roads, have been developed in 37 districts in these four NRDP provinces. Spatial data of the rural infrastructure have been captured using Geographic Positioning System (GPS). The spatial database is linked to a detailed attribute database that contains feature details. For example, road related information includes road type, starting and ending points, surface type and condition, information on the number of culverts and bridges etc. Although spatial and attribute data of the roads have been captured, roads are yet to be given unique identification numbers. In terms of capacity building, an IRAP/GIS unit has been established at MRD headquarters in Phnom Penh and four IRAP/GIS units are in operation at the PDRD offices. Necessary hardware and software have been procured for a fully functional GIS unit at the national and provincial levels. MRD staff at the centre and provinces have worked with the consultants.

The next step is to develop road inventories in other provinces building on the experience gained during the implementation of the IRAP/GIS project.

Options considered, preferred option and barriers: two options were considered: **Option 1**: start the development of a complete rural infrastructure inventory immediately, including that of roads, building on the experience gained during the implementation of the IRAP/GIS project; **Option 2**: progressively develop a complete rural infrastructure inventory under different rural infrastructure projects as done in four provinces under NRDP.

The chosen option is Option 1 (see Appendix V). The level of barriers that have been identified in implementing Option 1 is:

Financial: **medium**; Institutional: **medium**; Legal: **low**; Technological: **high**

4.3 Investment Prioritisation

Geographical Targeting of Road Investments

Geographically targeting poorer areas for road investments is one of the instruments to maximise the investment impacts on the poor (Hajj & Pendakur, 2000). However, comprehensive poverty data at the provincial level were not available in Cambodia till 2005, and therefore objective targeting methods could not be used. Towards the end of 2005, the World Bank published province-wise poverty figures based on an analysis of 2004 Cambodia Socio-economic Survey (CSES) data. With the help of these data an analysis has been conducted in order to help devise a strategy for geographical targeting of potential rural road investments.

Three criteria have been used to assess possible bases for geographical targeting at the provincial level: (i) poverty levels, (ii) values of agriculture production per unit area (as a measure of agricultural potential), and (iii) the number of donor-supported rural road related projects (as a measure of investment already made in the province). Appendix VI presents graphically the results of the analysis. The data used for the poverty analysis are given in Appendix VII.

The main conclusions from the analysis are: (i) The proportion of population below the poverty line is higher in the north and north-east parts of the country; (ii) The southern part of the country has a higher concentration of poor people (number of poor people per unit area), mainly due to the higher population density in the south; (iii) there is no spatial difference between the incidence of poverty and the poverty gap (that represents how far poor people are from the poverty line). This means that the nature of poverty is similar over the whole country; (v) the value of agricultural produce[4] per unit area is higher in the south and north west; (v) the main donor-supported projects, completed and current, are in the north west, centre and southern parts of the country

Options considered, preferred option and barriers: three options were considered for geographical targeting: **Option 1**: no objective targeting; **Option 2**: prioritisation of provinces on the basis of the extent of poverty only. **Option 3**: objective investment targeting using the following three-pronged strategy:

[4] Three main crops were taken into consideration for the calculation of the value of agricultural produce : rice, maize and cassava

- Prioritisation of provinces based on three criteria: extent of poverty, development potential (e.g. agricultural, tourism), and the level of investment already made.
- Targeting of districts within a province based on the level of poverty and quality of the rural road network;
- Targeting of areas that maximises the synergy between main roads and rural roads

The chosen option is Option 3 (see Appendix V) The level of potential barriers that will be faced in the implementation of Option 3 is:

Financial: **low**; Institutional: **low**; Legal: **low**; Technological: **medium**

The implications at the provincial level of selecting Option 3 have been based on a multi-criteria analysis, using the two alternative weighting systems presented in Appendix VIII. On the basis of weighting system A in Appendix VIII[5], the resulting provincial order of priority for future capital investment in rural roads is as shown below. Leaving out the "urban" provinces, the top five priority provinces are: Takeo, Kandal, Prey Veng, Svay Rieng and Kampong Cham.

1. Phnom Penh	13. Kampong Chanang
2. Takeo	13. Battambang
3. Kandal	13. Mondul Kiri
4. Prey Veng	14. Preah Vihear
5. Svay Rieng	14. Pursat
6. Sihanoukville	15. Rotanak Kiri
7. Kampong Cham	16. Koh Kong
8. Kep	17. Siemreap
9. Pailin	18. Oddar Meanchey
10. Banteay Meanchey	19. Kampot
11. Kampong Speu	20. Kratie
12. Stung Treng	21. Kampong Thom

Road Prioritisation and Standard Tools for Road Prioritisation

Rural roads in Cambodia are not generally prioritised using any objective methods. However, some donor assisted rural road projects often use tools for prioritisation. Since IRAP was introduced in 1999 under the ILO Upstream Project, it has been adopted by NRDP and the Provincial Rural Infrastructure Project (PRIP) for the preparation of the District Infrastructure Development Plan. The strengths of the IRAP process lie in its participatory approach, and the breadth of its outputs which include an "accessibility action plan" that reflects the community needs in five sectors including transport and trading infrastructure. The plan is supported by detailed maps and it provides approximate cost estimates for interventions in different sectors. While IRAP provides a good starting point for the preparation of infrastructure plans, it requires substantial resources to implement.

There are a number of other tools available for investment prioritisation including the Road Economic Development (RED) Model of the World Bank, Cambodia Rural Roads Economic Appraisal Model (CREAM) developed under the ADB assisted RIIP

[5] Number of poor people per sq km 0.5; value of main agricultural produce per sq km 0.25; number of present plus previous projects 0.25.

and ILO assisted Upstream Project. Appendix IX provides a summary analysis of the suitability of different available methods for ranking rural roads.

There is also Road Maintenance Management and Planning Systems (ROMAPS) for maintenance management and planning, which is already in use in Cambodia. ROMAPS was introduced in 2004-05. ROMAPS has so far been used in eight provinces, and TRIP IV plans to use ROMAPS in another seven provinces. Therefore, there already exists a lot of experience in the use of ROMAPS, and, with its use in TRIP IV, a total of 13 provinces will have the experience of using the system. However, ROMAPS requires a considerable amount of data and its suitability in situations where there is poor institutional capacity has been questioned in different quarters. Also the licensing arrangements are complicated and the software is costly to procure.

Options considered, preferred option and barriers: Three options were considered on the issue of rural road prioritisation and the use of a standard tool for road prioritisation: **Option 1**: to develop the roads on the basis of the IRAP developed plan. The potential pitfalls are that it is not suitable for prioritisation under resource constraints and may lead to an inappropriate allocation of resources; **Option 2**: to use the IRAP prioritised roads as a short-list of roads to be developed, and to use another prioritisation procedure in the final selection of roads that are to be developed or maintained; **Option 3**: the same as the second option, except that, while a prioritisation model will be used for improvement prioritisation, a more simplified tool will be used for the maintenance prioritisation. However, an informed decision is required concerning the final selection of road development prioritisation tools – both for improvement and maintenance.

The selected option is Option 3 (see Appendix V). The level of barriers that will be faced in the implementation of the selected option is:

Financial: **medium**; Institutional: **high**; Legal: **low**; Technological: **medium.**

4.4 Policies on Technical Issues

Roads and Rural Water Transport Complementarity

Rural water transport (RWT) plays an important role in rural people's lives in Cambodia. There are a number of studies that have highlighted the importance of rural water transport for the lives of the rural population (MRD & ILO, 2001; Sitha, 2005; Palmer and Barwell, 2005). Rural water transport increases rural mobility and helps rural people to access social and administrative services, and to take part in economic activities and social activities. The RWT sub-sector is also an important income source in rural Cambodia. Many rural residents' livelihoods are linked to rural water transport through the operation of goods and passenger riverine transport services, trading activities, and construction and repair of boats, and maintenance and repair of engines.

An estimated 1.4 million rural people (12.5% of the national total) live in areas where rural water transport is of major importance in their daily lives (Palmer and Barwell, 2005). Approximately 4 million rural people (37%) live in areas where rural water transport is either of major importance, or plays a significant role, in people's daily lives. These areas cover 68 districts and 16 provinces. Apart from the Tonle Sap basin, rural water transport is important in the north and east of the country (the upper Mekong and its tributaries to the Lao border) and in the southern lowlands (Phnom Penh and the region that borders with Vietnam). Many of Cambodia's poor live in

these areas. It is also widely believed that the proportion of poor people living in these areas is higher than other rural areas. For example, ADB (2004) estimates that approximately a half of the population in the Tonle Sap basin live below the poverty line and in some areas the figure is as high as 80%.

A recent study, relating to the development of a master plan for waterborne transport on the Mekong river system in Cambodia, assessed different options for the development of RWT in Cambodia. The study suggested different actions for the development of rural water transport. These actions included, among others, ensuring that rural development planning links feeder roads to river ports and landing places, enacting legislation that protects waterways from roads (e.g. bridge free-boards), and making sure that MRD considers RWT in its development plans.

Options considered, preferred option and barriers: two options were considered in the case of the water and land transport complementarity issue: **Option 1**: continue the current non-intervention strategy; **Option 2**: accept the master plan for water-borne transport study recommendations and take action to implement the recommendations.

The chosen option is Option 2 (see Appendix V). The level of barriers that will be faced in the implementation of Option 2 is:

Financial: **low**; Institutional: **medium**; Legal: **medium**; Technological: **low.**

Rural Road Standards

There are no accepted standards for rural roads in Cambodia. Roads are built following various standards. An attempt was made to harmonise rural road standards with the development of draft technical standards under the ADB assisted RIIP. The document detailed the work specification and technical standards of rural roads and bridges including geometric standards. A total of 9 types of cross-section (specifications of carriageway width, shoulder width, camber slope, embankment slope) are proposed for rural roads in the manual depending on the traffic volume and type of terrain though which the road passes. A total of 3 types of carriageway width are proposed – 6m, 5m and 4m for Average Daily Traffic (ADT) volumes of 100-200, 50-100 and up to 50 respectively. However, the document has not been extensively used within MRD. One of the reasons for non-use is that the standards were not formally introduced to the field level officials.

With DFID support, interim standards for tertiary and sub-tertiary roads have recently been developed. The interim standards are divided into two categories depending on the traffic flow. The standards give geometric dimensions for different rural road elements including carriageway width, shoulder width, camber, laterite thickness etc (Appendix X provides the proposed standards). The new standards are simpler than the ones proposed before. DFID is also supporting the development of the final rural road standards. The issue is whether MRD will adopt these interim road standards or not. There is also another issue that is raised by the Commune Councils regarding setting a minimum width for sub-tertiary roads. The CCs prefer more flexible standards for sub-tertiary roads. The arguments in favour of flexible standards for sub-tertiary roads are: (a) they will serve better the local needs and conditions; (b) they have the potential of a reduction of network improvement costs; (iii) the amount of land that will be required on both sides of the road will be less.

Options considered, preferred option and barriers: two options were considered on this issue: **Option 1**: do-nothing; **Option 2**: acceptance, dissemination and use of the

newly developed interim standards till the final standards are available, followed by acceptance, dissemination and use of the final road standards when they are available.

The chosen option is Option 2 (see Appendix V). The level of barriers that will be faced in the implementation of Option 2 is:

Financial: **medium**; Institutional: **medium**; Legal: **low**; Technological: **low.**

Rural Transport Services

In Cambodia, although the public sector is responsible for the provision of roads, the private sector is responsible for transport services. Such a model does not necessarily lead to automatic improvement of transport services on developed roads. Improved mobility and accessibility in rural areas will only be achieved if the rural population either own appropriate vehicles or the areas are served by affordable commercial public transport services. The availability of affordable commercial public road transport services is a function of several variables including good quality roads[6], population density (to achieve economies of scale for the operation of profitable transport services), and income levels of the users of those services (affordability).

With the development of roads, the non-poor in rural areas are expected to reap the benefits as they will increase their mobility either by purchasing vehicles or by using the private transport services available. However the poor are least likely to exploit the full potential of the road improvement benefits as they are least likely to own vehicles to improve their mobility, their low income reduces their fare paying abilities, and the proportion of poor in Cambodia is higher in areas which are sparsely populated where private transport operations will not be so profitable given the low density of demand. Unfortunately, no social-class disaggregated data on vehicle ownership is available in Cambodia, although there is evidence that vehicle ownership, especially non-motorised vehicles, is high in rural areas. Rozemuller et al. (2002a) found in a district of Siemreap province that an overwhelming majority of the households (88%) either owned a bicycle (70%) or an ox-cart (18%). However, study results from Vietnam (DFID, 2005) suggest that the probability of a poor household purchasing a new vehicle after road improvement is considerably lower (27%) than that of a non-poor household (77%)[7]. Due to the non-availability of any empirical study results it is difficult to conclude with certainty the level of problems faced by the rural population in Cambodia, especially the rural poor, regarding transport services.

Options considered, preferred option and barriers: The number of options considered was two: **Option 1**: continue the current non-intervention strategy and leave the supply of transport services to market forces alone; **Option 2**: develop detailed rural transport service related policies and strategies supported by a detailed study on the availability and use of rural transport services by the rural population, especially the rural poor, to serve their access and mobility needs.

The chosen option is Option 1 (see Appendix V). The level of barriers that will be faced in the implementation of Option 1 is:

[6] A study on the transport operators in Cambodia suggests that road improvement may result in a 17% reduction in transport tariffs (Rozemuller et al, 2002b). Road improvement also leads to higher numbers of trips by the operators and thereby there are more transport services available.

[7] A further study in Ghana - DFR (2006) - indicates that the non-poor are quick to respond to the opportunities created by road developments.

Financial: **low**; Institutional: **low**; Legal: **low**; Technological: **low.**

4.5 Policies on Social and Environmental Issues

Participation of Women in Roadworks

Women constitute slightly more than half of Cambodia's population, but the economic activity rate is higher for men compared to women, and the unemployment rate is higher for women than men (NIS, 2002). Also approximately a fifth (19.6%) of Cambodia's households are female-headed (RGC, 2000). CMDG 3 has three indicators that seek to increase higher women's employment in different sectors. There are limited off-farm employment opportunities in rural Cambodia, and for women such opportunities are even lower. NPRS commented that poverty cannot be reduced unless policies and programmes address women's employment issues. NPRS concluded that addressing such issues will not only address women's equity issues, but will also strengthen the efforts for development and poverty reduction.

Therefore, there is a need to take actions so that a fair share of women's participation in roadworks is ensured. However, the concept of promoting women's participation in roadworks is not new. A number of rural road projects made efforts to employ women in higher numbers, notably the TRIP and ILO upstream projects. Women's participation in roadworks was 43% under the ILO upstream project with less than 20% being the technical supervisory staff (Zweers & Kassie, 2000).

Options considered, preferred option and barriers: Two options were considered to address the issue. They were: **Option1** - do-nothing, leaving the issue of employment of women in roadworks to market forces; **Option 2** - deliberate interventions to promote women's participation in roadworks.

The chosen option is Option 2 (see Appendix V). Implementation of Option 2 will face the following level of barriers:

Financial: **low**; Institutional: **medium**; Legal: **low**; Technological: **low**

Roadworks and Environmental Sustainability

One of the CMDGs (CMDG 7) is linked to environmental sustainability, and the draft rural road policy clearly states the necessity of development of rural roads in an environmentally sustainable way. However, the environmental consequences of rural road development are not thought to be significant. An overwhelming majority of them are constructed on existing alignments and therefore there is no significant probability of using agricultural or forest land. Evidence from a Cambodian study further confirms that rural road construction does not have any significant negative environmental impacts (MRD and Seila, 2004). On the other hand, rural roads provide access to remote areas and there may be environmental consequences due to deforestation arising from logging activities. Also roads built without proper drainage considerations may be responsible for waterlogging and consequently, environmental degradation. Apart from the above there are considerable negative impacts directly associated with rural road development arising out of dust pollution for unsealed roads and quarrying operations to extract surfacing gravel.

The current approach for addressing the environmental issues related to road improvement is not comprehensive. Environmental issues are tackled at the project level and depend on the requirements of the funding agencies. For example, ADB has conducted an initial environmental examination (IEE) of projects as part of the NRDP preparation study. Similar examinations are also conducted in the case of other

foreign assisted projects. Therefore, the tasks of road improvement related environmental assessment, and the design and implementation of the mitigation measures, remain to be institutionalised.

DRR at MRD headquarters currently do not have any capacity to address environmental issues, and the current environmental assessment and monitoring capabilities at the provincial level (within the Provincial Environmental Department (PED) and Provincial Office of Rural Roads (PORR)) are also weak. It will require a considerable effort to institutionalise the issue within MRD.

Options considered, preferred option and barriers: There are two strategic options that were considered to address the issue: **Option 1** - continue with the project based approach; **Option 2** – gradually develop in-house capacity for environmental assessments, implementation, and monitoring capabilities to ensure sustainability of the interventions.

The chosen option is Option 2 (reasons for such a choice is provided Appendix V). The potential level of barriers in the implementation of Option 2 is:

Financial: **medium**; Institutional: **medium**; Legal: **low**; Technological: **medium**

Road Safety

Road traffic accidents are a major concern for the RGC. Cambodia has one of the highest road accident related fatality rates in the region, when compared on the basis of the number of vehicles in use and the length of the paved road network (Handicap International, 2005). Currently the number of casualties per day in Cambodia due to road accidents is 23 (3 fatalities and 20 injuries). The forecast is that the growth of the number of road traffic casualties will be exponential if no or insignificant action is taken. The cost of road traffic accidents to Cambodia is estimated at $120 million every year, which is over three percent of the GDP.

The average age of road accident casualty victims is just below 30 years, and an overwhelming majority (75%) of accident victims are in the economically active population group (aged between 20 to 64). Worse still, although people aged between 20 and 24 years represent only ten percent of the population, they comprise approximately a fourth of the casualties. Motorbikes are mainly responsible for the overwhelming majority of the accidents that account for three quarters of the road traffic accidents. Also a high proportion of the pedestrian and bicycle accident victims are children and senior citizen.

Road conditions are considered to be one of the four main causes of road accidents - others being human error, vehicle defects, and the nature of the law and its enforcement. Cambodia has taken a number of steps to reduce the number of traffic accidents. Cambodian has recently enacted a new land traffic law, which became effective in early 2007 after its approval by the King. The law stipulates maximum axle and total loads carried by a vehicle on Cambodian roads. Cambodia has also created a National Road Safety Committee aimed at increasing collaboration, cooperation and facilitation between ministries and related institutions to prevent and reduce road traffic accidents. A national road safety action plan has also been drafted.

Although disaggregated accident data on primary and rural road networks are not available, it is believed that the number of accidents on rural roads is not substantial given the low traffic volume. However, motorcycles comprise a large proportion of traffic on rural roads which are responsible for an overwhelming majority of road

accidents. Also pedestrians and bicycle accidents are more likely to happen on rural roads than main arterials given their much greater prevalence.

Options considered, preferred option and barriers: MRD considered two options to address the issue. They were: **Option1** - do-nothing, leaving road safety issues to other stakeholders; **Option 2** – proactively pursue road safety related issues and support other stakeholders to reduce traffic accidents on rural roads.

The chosen option is Option 2 (see Appendix V). Implementation of Option 2 will face the following level of barriers:

Financial: **low**; Institutional: **medium**; Legal: **medium**; Technological: **low**

Rural roads and risks of spreading HIV/AIDS

The high prevalence of HIV/AIDS, and the predicted increase in HIV infections, are a major threat to Cambodia's development. HIV/AIDS is expected to increase the mortality significantly within a decade, leading to a significant decrease in life expectancy in Cambodia. One of the CMDGs is connected to HIV/AIDS (CMDG 6), and a recent assessment suggests that, although progress made in the achievement of HIV/AIDS linked indicators is good, the rate of achievement of at least one indicator is below target. The quiet spill-over of HIV/AIDS into rural areas has been expressed as a major concern in a UN report.

Although improved rural transport brings many economic and social benefits, it can also be responsible for the spread of HIV/AIDS into rural areas. There are several specific links including: (i) short term risk during the construction period, as migrant workers are often employed on rural roads infrastructure construction. Migrants are both vulnerable to contracting the infection and responsible for spreading it; (ii) long term risks from the operators of freight and passenger transport services (drivers and conductors) who are known to be a high risk group. In addition, the mobility of the rural population increases with improved rural transport, and increased mobility for trading and leisure places such people at a greater risk of contracting the infection.

However, there are now a number of tested measures that can be adopted to mitigate the risks of increased incidence of HIV/AIDS. The use of local resource based technology, that encourages the use of local labourers, can mitigate the risk of spreading of the infection from migrant labourers. Other mitigation measures may include the inclusion of contract document clauses that requires the contractors to provide health education to workers and distribute condoms, HIV/AIDS awareness campaigns in the area of the construction works, and support for similar national campaigns.

Options considered, preferred option and barriers: MRD considered two options to address the issue. They were: **Option1** - do-nothing; **Option 2** – take feasible steps to reduce the risks of the spread of HIV/AIDS infections from road construction related activities, and support national HIV/AIDS awareness campaigns.

MRD has chosen Option 2 (see Appendix V for reasons). Barriers linked to the implementation of Option 2 will be:

Financial: **low**; Institutional: **medium**; Legal: **low**; Technological: **low**

Stakeholder participation

The purpose of rural road improvement and maintenance is to enhance social and economic development in rural areas, thereby improving rural residents' welfare. The

participation of stakeholders in rural road programmes can improve the chances that road interventions will be more effective and sustainable for two reasons: (i) it increases the likelihood that the project design is appropriate to the needs of the area; and (ii) it can contribute to the sustainability of the road through greater local ownership.

Stakeholders are groups of people who share a common interest. Within any of these groups there are sub-categories of stakeholder with differing interests. Stakeholders are divided into two broad groups: primary stakeholders, who expect to benefit directly from, or be adversely affected by, the interventions; and secondary stakeholders with intermediary roles in the project. Stakeholder participation does not automatically guarantee the involvement of all stakeholders in the decision making process, and it is often the case that the poor and disadvantaged groups are left out of the process with the result that the design of the project fails to address their needs. One of the main challenges in stakeholder participation in a project is ensuring the participation of the poor and disadvantaged groups in the participatory activities.

Participation of stakeholders, mainly primary stakeholder, is required at all stages of the project – from project identification to implementation to monitoring and evaluation. The extent of participation may vary widely – from spontaneous to passive participation depending on the type of road project. Stakeholder participation in road projects is not well-established in Cambodia. There has been some valuable experience gained by MRD from the involvement of stakeholders in the IRAP process (see Section 4.3 for details) under the NRDP. There is now a need to mainstream stakeholder participation at all stages of MRD road projects.

Options considered, preferred option and barriers:

The options considered by MRD to address the issues were: **Option1** - addressing the stakeholder participation issues on a project by project basis; **Option 2** – taking steps to comprehensively address the stakeholder participation issues at all stages of the project cycle.

The chosen option is Option 2 (see Appendix V). Option 2 will face the following level of barriers in its Implementation:
Financial: **low**; Institutional: **medium-high**; Legal: **low**; Technological: **low**

CHAPTER 5

FINANCING

This chapter examines different rural road improvement options under a number of assumptions including the rate of network improvement and extent of improvement; the financial implications under these options; the potential available funding and the funding gaps. The best improvement option is assessed at the end of the chapter.

5.1 Funding for Improvement and Maintenance

Funding sources for improvement and maintenance of rural roads include (i) government funding from the Priority Investment Programme (PIP)[8] and Fund for Repair and Maintenance of Roads (FRMR)[9], (ii) donor agencies and (iii) the Seila/NCDD[10] programme channelled directly to the Commune Councils in the form of the Commune-Sangkat Fund. It is estimated that a total of US$ 20 million was spent on the development and maintenance of rural roads in 2005. Of this amount:

(i) over a half (56%) came from different donor assisted projects;

(ii) over a third (36% or US$ 7.1 million) came from the C/S Fund (Appendix XI provides the C/S Fund allocation details for 2002-05); and

(iii) the remainder (8% or roughly US$ 1.7 million) came from government sources.

5.2 Network Improvement Rate and Potential Resource Requirements

Chapter 1 mentioned that the estimated length of the rural road network is 28,000 km, of which an overwhelming majority is in poor condition. The survey that provides the basis for the calculations below covered approximately 24,000 km of the total network, and therefore the results have been factored up by 16.5% to represent the total network of 28,000km.

For the development of the strategic plan, an analysis of resource requirements has been carried out using different scenarios. The scenarios assume different assumptions for the rate of network improvement, as presented in Table 6.The main differences between the different scenarios are (i) the rate of improvement of ST2 and ST3 roads, and (ii) the assumption that there will only be spot improvement for ST3 roads under Scenarios 2 and 3.

[8] Priority Investment Programme (PIP) is drawn up by MoP. This programme supports capital expenditure in transport and other sectors.

[9] The FRMR was established in 2000. The fund is under the authority of the Prime Minister and managed by MEF. To fund the FRMR, fuel levies of 2 US Cents and 4 US Cents per liter on gasoline and diesel respectively were introduced in 2002. The total revenue from the levies is estimated to be between 20-25 million US$.

[10] The Seila programme was replaced by the NCDD in January 2007 (see Section 1).

Table 6: Different Rural Road Network Improvement Scenarios

	Scenario 1	Scenario 2	Scenario 3
Bring all T roads to maintainable standard (yrs)	7	7	7
Bring all ST1 roads to maintainable standard (yrs)	10	10	10
Bring all ST2 roads to maintainable standard (yrs)	10	10	15
Bring all ST3 roads to maintainable standard (yrs)	10	15	20

Estimates of the annual funding requirements for the next 10 years (2007-2016) that would be required for the development and maintenance of the roads have been made for each of these scenarios. The main assumptions that were made are presented in Appendix XII, including the unit costs of improvement and maintenance, and the frequency of periodic maintenance. Appendix XIII gives the estimates of the costs per year for each scenario. Table 7 provides the summary cost estimates under different scenarios. The per year average costs for development/improvement and maintenance are approximately US$ 49 million, 36 million and 31 million for Scenarios 1, 2 and 3 respectively. These figures are roughly 245%, 180% and 155% of the 2005 funding level.

Table 7: Average per year improvement and maintenance funding requirements between 2007-2016 (million US$)

	Scenario 1	Scenario 2	Scenario 3
Development/Improvement	**31.4**	**21.0**	**17.2**
[Periodic Maintenance]	[13.9]	[12.3]	[11.1]
[Routine Maintenance]	[3.3]	[2.9]	[2.7]
Total Maintenance	**17.2**	**15.2**	**13.7**
Overall	**48.6**	**36.2**	**30.9**

Note: In 2006 prices

5.3 Potential Resources Available and Funding Gaps

Table 8 provides estimates of the availability of resources for rural roads. These estimates are made on the following assumptions:

(i) Tertiary and ST1 roads will be under the management of PDRD, and the ST2 and ST3 roads will be under the responsibility of the CCs[11].

(ii) Funding available for T & ST1 Roads:
- Development/improvement – committed project funding (e.g. TRIP, NRDP) plus WFP up to 2009.
- Maintenance – project funding plus funding under FRMR with an assumed rate of increase 5% per year.

(iii) Funding available for ST2 & ST3 Roads – two-thirds of the Commune-Sangkat fund for infrastructure, which is assumed to increase at 5% per year, of which
- Two-thirds is for development/improvement and

[11] The draft rural road policy stipulates that MRD will delegate the day to day management and the implementation of rural roads related responsibilities to PDRDs. However, PDRDs are expected to devise a strategy for the management of rural roads in consultation with CCs. The strategy is developed under an assumption that the PDRDs will delegate development and management responsibilities of ST2 and ST3 to CCs.

- One third for maintenance.

On these assumptions: (i) the overall average available funding per year would be US$ 13.9 million over the years 2007-16; (ii) of this amount approximately 60% would be available for development; and (iii) the funding available for ST2 and ST3 roads would be more than two times higher than for T and ST1 roads.

Table 8: Availability of per year development and maintenance funding, 2007-2016 (million US$)

	Overall	Tertiary and ST1 Roads	ST2 and ST3 Roads
Development/improvement	8.1	1.5	6.6
Maintenance	5.8	2.5	3.3
Overall	13.9	4.0	9.9

Note: In 2006 prices

Table 9 shows the funding gaps for the different scenarios, disaggregated by road type, and for improvement and maintenance. The average funding gaps per year under scenario 1, 2 and 3 are roughly US$ 35 million, US$ 22 million and US$ 17 million.

Table 9: Potential per year gaps in funding (million US$)

	Scenario 1	Scenario 2	Scenario 3
Funding gap (improvement)			
T & ST1	6.1	6.1	6.1
ST1 & ST2 roads	17.2	6.8	3.0
Total	**23.3**	**12.9**	**9.1**
Funding gap (Maintenance)			
T & ST1 roads	4.2	4.2	4.2
ST1 & ST2 roads	7.1	5.2	3.7
Overall	**11.3**	**9.4**	**7.9**
Overall gap			
Total	**34.6**	**22.3**	**17.0**

Note: In 2006 prices

5.4 Analysis of Options and Preferred Option

Option 1: Scenario 1 can be considered ambitious. The potential funding gap for the implementation of this scenario is very high – the potential per year gap is more than two and a half times that of the estimated available funding per year (i.e. Scenario 1 would require additional funding equivalent to more than two and a half times of what is estimated to be available at present). Therefore, this option is rejected;

Option 2: Scenario 2 is moderately ambitious. The potential funding gap for the implementation of this scenario is considerable – the potential average gap per year is more than one and a half times that of the estimated available funding per year. Therefore, this option is unlikely to be realistic.

Option 3: Scenario 3 seems to be the most realistic one, although it remains challenging. The per year funding requirement is 55% above the estimated level of funding in 2005, and the potential funding gap is approximately equal to the estimated available funding per year.

The chosen option is Option 3. The level of barriers in the implementation of Option 3 has been assessed as:

Financial: **high**; Institutional: **medium**; Legal: **low**; Technological: **medium**

CHAPTER 6

SUSTAINABILITY

The issues related to sustainability include:

(i) **Intervention sustainability** covering the development of a sustainable maintenance management system, and overloading control;

(ii) **Cost-effective delivery of the outputs** covering the involvement of the private sector, and use of labour-based appropriate technology (LBAT) in road works (which also has a social perspective);

(iii) **Rural road surfacing**, which encompasses both intervention sustainability and cost-effectiveness; and

(iv) **Monitoring and evaluation** of rural road projects which provide lessons for future sustainability.

6.1 Intervention Sustainability

Development of a Sustainable Maintenance Management System

Carrying out timely and adequate maintenance is one of the most important tasks in road management. Non-maintenance of roads causes a rapid decline in asset value, and it costs more to rehabilitate the road again following non-maintenance than to maintain the road on a regular basis. A recent study in Cambodia compared the costs of periodic rehabilitation with the costs of regular maintenance, and found that about 42% of the net present value of the roads will be lost if no maintenance work is carried out (MRD & Seila, 2004). Non-maintenance of roads can also cause serious constraints to mobility, significantly raise costs of vehicle operations, and aggravate isolation, poverty, poor health and illiteracy to rural communities (World Bank, 2005). Cambodia, like many other developing countries, has not allocated sufficient funds for regular road maintenance operations, nor has it managed to devise a sustainable maintenance management system.

The 2002 Draft Rural Roads Policy clearly defined the ownership and management responsibilities of rural roads. However, there is no formal management system in place, and no formal maintenance system. There have been a number of initiatives within MRD to improve the rural road maintenance management system, one of which was under the ADB funded Rural Infrastructure Improvement Project (RIIP). The project has made an effort to develop a maintenance management system in eight provinces, and there has also been a trial run of the system in communes. The initiatives under the project included the development of a paper-based inventory; training of maintenance engineers; establishment of a fund flow mechanism between the central and local governments; and setting up community maintenance committees. The system used ROMAPS in the prioritising of the maintenance interventions. RIIP has also developed a Rural Road Maintenance Manual. In addition, TRIP IV has taken initiatives to develop a maintenance management system in 7 provinces using ROMAPS. It is expected that at the end of 2008 a total of 11 provinces will be familiar with the system.

A recent Cambodia maintenance management review identified six major activities for a road maintenance management system including a road inventory (Intech-TRL, 2005a). The review has identified a system similar to the system used under RIIP, but proposes a number of improvements including the computerisation of the data

processing functions using appropriate database software, and development of a methodology for prioritisation of the roads.

The main issue is what type of maintenance management system should be used for the MRD rural roads. Two key questions are: (i) How feasible is it to start the development of a comprehensive computerised system, supported by a GIS based spatial and attribute database? (ii) Should MRD start with a basic system and progressively switch to a more sophisticated system?

Options considered, preferred option and barriers: There were three options to address the issue: **Option 1**: do-nothing option; **Option 2**: development of a comprehensive and sophisticated system: Under this system the maintenance decision-making would be supported by a GIS spatial and attribute database covering the whole country; **Option 3:** Implementation of a basic maintenance system and gradual progression towards a more sophisticated system: This option requires the implementation of a basic maintenance management system similar to the one proposed under RIIP but with some improvements (e.g. computerising data processing, development of computerised data processing activities, and developing a prioritising methodology). It also requires the development of a parallel more sophisticated system on a pilot basis in a province where spatial and attribute road data are available from the IRAP/GIS project. Based on the pilot results the system would be adjusted and gradually extended into other provinces, starting with other provinces where data similar to the pilot province are available. Ultimately the system would be adopted all over the country.

The chosen option is Option 3 (see Appendix V). The level of barriers that the implementation of Option 3 is expected to face is assessed are:

Financial: **medium**; Institutional: **high**; Legal: **low**; Technological: **medium-high**

Overloading Control

Overloading is a problem for all types of roads in Cambodia. The number of axles on which the load is carried is an important factor in overloading control; the same load carried on two axles has much less impact than the same load carried on a single axle. Doubling the load without an increase in the number of axles will increase the effect by sixteen times. Consequently, overloading severely accelerates road deterioration and increases the future maintenance and investment requirements. Apart from the pavement damage, problems associated with overloading include the safety of the overloaded vehicles.

Notwithstanding the damage overloading causes, the private sector vehicle operators are reluctant to self-regulate as they take decisions on vehicle loading purely on net revenue or other commercial criteria. They do not take into consideration the pavement damage costs.

Almost all developing countries suffer from overloading problems and it is not easy to solve them. The potential solutions lie in the enactment of an appropriate law to control overloading and the enforcement of the law. However, given the spatially dispersed nature of the road infrastructure, such enforcement cannot be done simply by the law enforcement agencies. It requires cooperation from the road users and from the population living along the road corridors. Due to the severity of the effects of

overloading in Cambodia, an inter-ministerial declaration was made in 2004[12] that specified several measures to tackle the problem. The measures included setting maximum axle-load limits for different road types (e.g. 6 tonnes for vehicles with two axles on rural roads), and making provisions for physical obstacles (e.g. erection of safety pillars 2.3m apart). The declaration has given MPWT and MRD the responsibility for implementing these measures.

On many rural roads in Cambodia barriers have been constructed to minimise the damage caused by overloading vehicles. However, the outcome is mixed. In a number of cases the barriers were destroyed by the oversized vehicle. In addition, there are strong arguments against the usefulness of physical barriers, including: (a) controlling width will not necessarily ensure control of the axle load; (b) they restrict the use of roads by larger vehicles which are potentially more efficient vehicles for carrying passengers and freight; (c) the network-wide effects of erecting the barriers on selected roads may not be wholly positive (or may even be negative) as the overloaded vehicle might use other indirect routes to avoid the barriers.

The above discussion shows that there are no simple solutions to control overloading. Apart from the appropriate law, it will require cooperation from law enforcing agencies, the vehicle operators (especially truckers) and people living along the roads.

Options considered, preferred option and barriers: Two strategic options were considered regarding the problem of overloading: **Option 1** – do-nothing; **Option 2** – selection and implementation of appropriate interventions to control vehicle overloading.

The preferred option is Option 2 (see Appendix V). The potential level of barriers in the implementation of the selected option is assessed as:

Financial: **low**; Institutional: **medium**; Legal: **high**; Technological: **low.**

6.2 Cost-effective Delivery of the Outputs

Involvement of Private Sector in Development and Maintenance

The role of the private sector has been highlighted in the NSDP (2006-2010). The "Rectangular Strategy" of RGC has also stressed the need for the promotion of the private sector which is considered as the "engine of growth". The private sector is responsible for the provision of an overwhelming majority of jobs in Cambodia. Small and Medium Enterprises (SMEs) make up 99% of the enterprises and half of the employment in the private sector. The private sector in the construction industry consists of individual entrepreneurs (often informal), SMEs, and international companies that are active in Cambodia. The draft policy for rural roads strongly encourages the use of local private sector contractors in construction, rehabilitation and maintenance of roadworks.

The capacity of the local construction industry in Cambodia is weak. There have been limited opportunities for local companies given the dominance of foreign contractors and consultants, and the use of force account methods for many roadworks. However, there is now a growing capability due to an increased volume of joint-venture and sub-contracted works under different donor-funded projects. The availability of an

[12] MPWT and MRD Inter-Ministerial Declaration on Maximum Legal Loading on Provincial & Rural Roads; 23 June 2004

increasing number of LBAT contractors trained under different projects is also helping in out-sourcing to the private sector.

There are three different models for the implementation of the tertiary road related roadworks:

(i) Implementation through out-sourcing to private contractors, which is the most common method used by PDRD and Commune Councils;

(ii) Implementation though the use of force account methods, which is sometimes the preferred method for the execution of roadworks. ILO (2000) provides a number of reasons for force account use over private contractors by PDRD officials in roadworks including creation of job opportunities for departmental staff, utilisation of government construction equipment, time savings in the bidding process for the selection of private contractors, and less requirement for quality control.

(iii) A combination of force account and private sector: under this method while the private sector supplies (some or all) the equipment and materials, the actual work is carried out by the public sector using government equipment and force account labourers.

Options considered, preferred option and barriers: In line with the RGC's policy to strengthen the private sector, two options were considered to address this issue: **Option 1**: immediate out-sourcing of all construction and maintenance of roadworks to private contractors, and prohibiting the direct involvement of the public sector in rural road construction and maintenance activities; (ii) **Option 2**: gradual phasing out of the involvement of the public sector in rural road related roadworks with the gradual development of the private sector capacity, especially the development of the capacity of LBAT contractors.

The option selected is Option 2 (see Appendix V). Implementation of Option 2 is expected to face the following level of barriers:

Financial: **low**; Institutional: **medium**; Legal: **low**; Technological: **medium**

Application of Labour-based Technology in Roadworks

There is overwhelming evidence of the advantages of the use of labour-based methods over equipment-based methods in roadworks in developing countries (IT Transport, 1999, IT Transport, 2004, Stiedl, 2002). The advantages are not only limited at the project (micro) level (e.g. the financial cost advantage of labour-based methods), but also relevant at the macro-economic level (e.g. the higher multiplier effects of labour-based methods over equipment-based methods). Studies conducted in Asia and Africa have concluded that labour-based methods were cheaper than equipment based methods, both in financial and economic terms. A Cambodian study commissioned by the ILO ASIST-AP in 2002 mentioned several advantages of the use of labour-based methods over equipment-based methods in rural road construction (Stiedl, 2002). The main advantage is the high employment generation potential of labour-based techniques: labour-based methods have the potential to generate 18 times more employment than equipment-based methods. The study quoted that the use of labour-based methods in upgrading, combined with maintenance, of the existing maintainable network, could generate between 3.6 to 6.5 million person days of work per year. Labour-based methods were also considered to be cost-effective. The estimated break-even wage rate to bring the cost of the labour-based approach into parity with its equipment-based counterpart was US$ 2.1 per day. The study

conclusion is that even if the labour wage is doubled from its current level, the labour-based approach would still be financially competitive.

The policy of MRD is to use labour-based appropriate technology (LBAT) in the construction and maintenance of rural roads. The draft rural roads policy clearly states that LBAT is the preferred method for all types of roadworks. It is in line with the RGC's policies of employment creation, poverty reduction and local resource utilisation, apart from the other advantages of the use of LBAT.

However, there are a number of obstacles in mainstreaming LBAT. They include: (i) mis-perception: some officials, especially field level officials, believe that LBAT is more expensive than its equipment-based counterpart; (ii) technology management: officials at the field level find it easier to manage an equipment-based technology and are therefore more inclined to use it; (iii) quality of outputs: there exists a wide misconception that LBAT roadwork outputs are inferior to equipment-based outputs; (iv) non-availability of labourers: In some parts of Cambodia it is difficult to find labourers willing to work on the road.

The positive factors on the side of LBAT are that Cambodia already has considerable experience in the use of LBAT. A number of field officials and contractors have already been trained in the use of LBAT under different projects starting with the Rural Road Maintenance Initiative (RRMI) under the ILO Upstream project. This has helped in the development of a group of LBAT contractors. Another ILO assisted project, the Labour-based Rural Infrastructure Rehabilitation and Maintenance Project that ran between 1996-99, has partially dealt with the capacity development issues of MRD officials to deal with LBAT roadworks.

Options considered, preferred option and barriers: Two options were considered under this issue: **Option1** - no proactive interventions; i.e. leaving the choice of technology to market forces; **Option 2** - proactive interventions including positive discrimination in favour of LBAT.

The chosen option is Option 2 (see Appendix V). Implementation of Option 2 is expected to face the following level of barriers:

Financial: **low**; Institutional: **medium**; Legal: **low**; Technological: **medium**

6.3 Rural Road Surfacing

Approximately 40% of Cambodia's rural roads have a laterite surface (Table 3 in chapter 1), and the figure for tertiary roads is as high as 70%. However, there has been increasing recognition, supported by empirical studies conducted in Vietnam, that gravel surfacing is not the best solution under all circumstances. Petts et al. (2005) described gravel as a "wasting" surface given the material loss due to the action of traffic and rainfall. Petts et al. (2005) have identified a number of conditions that need to be satisfied for gravel to be a viable surfacing option including conditions relating to the level of traffic, rainfall intensity and hauling distance. The common belief that gravel could be suitable for roads with traffic flows between 50 and 200 vehicles per day appears to be inappropriate as was found by recent gravel surfacing research in Vietnam. Intech-TRL (2005b) has recently concluded that stage construction with gravel being the initial material is also disadvantageous given that a significant degradation may occur if the seal is not applied within six months, or at least before the first rainy season. Apart from the above there are safety, health and environmental concerns due to the dust generated by traffic on gravel roads.

Gravel is a low capital but high maintenance cost option. It is widely believed that when whole life costs of different surfacing options are evaluated, gravel will not be the most cost-effective surfacing option in most situations – although such a notion is yet to be substantiated by empirical studies. There is a range of proven alternatives to laterite surfacing. A recent study in Mozambique has tested seven types of bituminous surfacing that were applied to gravel roads using labour-based methods (Ford and Done, 2005). These surfacings range from penetration macadam to single sand seal and the costs range from US$ 1.06 to 3.8 per square metre. The study found the conditions of the different surfacing applications to be generally good after three and a half years. The study recommended that single surface dressing is the most suitable surfacing option considering its performance and cost. Intech-TRL (2005b) has indicated the effectiveness of unsealed stone macadam as a sustainable surface/road-base from a study in Vietnam, although there are high surface erosion and/or roughness penalties. Another option proposed by Intech-TRL (2005b) is the use of natural stone, without bitumen or cement binder, that has superior performance to gravel with reasonable initial costs and lower maintenance costs.

There has been no study conducted in Cambodia on the conditions under which gravel is the most appropriate surface or road-base. However, considering the study results from neighbouring Vietnam and the high rainfall intensity (well over 1,000mm per year in an overwhelming number of provinces), it appears that gravel is only likely to be the most appropriate option as a road surface under a limited range of conditions in Cambodia.

A low-cost road surfacing trial was conducted in Pouk District in the early 2000s with the objective of generating information on low-cost surfacing options with the ultimate goal of producing international guidelines on this issue. A total of 10 alternative road surfaces were trialled in the study. A number of other studies are currently being undertaken in Cambodia, Vietnam and Laos on this issue, and the Cambodia and Vietnam study results are expected to be available sometime in 2007. It is expected that guidelines on surfacing alternatives for unsealed roads will be developed using trial study results. Such guidelines will help in making informed decisions on low-cost surfacing options.

Options considered, preferred option and barriers: Two strategic options were considered in relation to rural road surfacing: **Option 1** - continue the use of gravel as the main surfacing material; **Option 2** - the continuation of trials of other surfacing options, resulting in conclusions on the best options for different traffic, physical and climatic conditions, and the progressive replacement of gravel as the main surfacing material.

The preferred option is Option 2 (see Appendix V). The potential level of barriers in the implementation of Option 2 is:

Financial: **medium**; Institutional: **medium**; Legal: **low**; Technological: **high-medium**

6.4 Monitoring and Evaluation

A well-designed Monitoring and Evaluation (M&E) system provides information about the performance of the policies, programmes and projects, which can identify what works, what does not work, and also the reasons why. It therefore helps in identifying and undertaking remedial measures that are required to ongoing projects; and in designing future projects that take into consideration the lessons learnt. M&E is a vital component in the project cycle.

MRD currently does not have a systematic monitoring and evaluation (M&E) system. In the past M&E has generally been carried out only for individual projects, and the results have not been pulled together and disseminated within MRD. Although the Department of Rural Roads has a M&E Office, it does not have the capacity to undertake the complex tasks of M&E.

One option is to carry out process monitoring only. This is relatively simple, but will not be sufficient to monitor the effectiveness of measures to implement the RGC's policy to factor poverty and gender concerns in all activities.

The current worldwide emphasis is on results-based M&E systems, which are more complex. The results-based M&E system emphasises the monitoring of outcomes, or developmental changes, rather than just the monitoring of outputs. Such a system requires the tracking of changes of outcome indicators at the ex-ante and ex-post stages of the project. The evaluation of outcomes validates the results, and explains the reasons for the achievement or non-achievement of indicators.

Options considered, preferred option and barriers: MRD has considered two strategic options regarding the M&E of rural road projects/programmes: **Option 1** – adoption and implementation of a process monitoring system; **Option 2** – adoption and implementation of a uniform results-based M&E system and undertaking a number of appropriate actions to help implement the system.

The preferred option is Option 2 (see Appendix V). The potential level of barriers in the implementation of Option 2 is:

Financial: **medium**; Institutional: **medium-high**; Legal: **low**; Technological: **medium**

CHAPTER 7

INSTITUTIONAL

This chapter deals with:

(i) Institutional and human resource development

(ii) Communication and co-ordination issues.

7.1 Institutional and Human Resource Development

Institutional Strengthening

The Department of Rural Roads (DRR) within MRD has been mandated to carry out the rural road management responsibilities within MRD. DRR was established only a few years ago (in 2002) under MRD's General Department of Technical Affairs. DRR carries out wide ranging functions including development, rehabilitation and maintenance of rural roads; traffic data collection and analysis; and providing assistance to Commune Councils. DRR has a counterpart Provincial Office of Rural Roads (PORR) in each Provincial Department of Rural Development (PDRD) and a rural road unit in each District Office of Rural Development (DORD). The department is headed by a Director and a number of Deputy Directors. There are five offices in the department to perform distinct functions that range from general administration to research and development. Appendix XIV gives the organisational structure of MRD and DRR.

The organisational arrangements at DRR are adequate for carrying out the responsibilities mentioned in the Prakas issued to create the department. However, only a few of the officials in the department have road or road related qualifications and experience (see Appendix XV for details of the educational levels of the officials working at DRR), and a number of them are working on different projects in MRD, thereby seriously hampering the work of the department. The situation in PORR is worse. Although some of the provinces have adequate numbers of qualified staff to carry out their road management related responsibilities, some of them do not. For example, Koh Kong and Mondul Kiri provinces do not have any qualified professional staff to carry out road improvement and maintenance tasks. The situation appears to be desperate in the districts where there is hardly any qualified staff to perform road related tasks. The CCs also do not have any technical capacity to manage the roads under their responsibility. Currently they depend on technical support from the NCDD programme, but this does not appear to be a sustainable solution.

Given that the D&D process is on-going, it is difficult to assess what roles the provinces, and more especially the districts, will play in the management of roads in the future. However, the road management responsibilities are not expected to change substantially for the CCs, and there is an immediate need to strengthen the capacity for managing the roadworks carried out under the C/S Fund, given that a substantial amount is being spent for road development at the commune level. This could be done thorough an institutional study that pinpoints the management capacity building requirements at the commune level and/or at the district/provincial level to support the CCs. One of the study outputs would be an action plan to increase management capacity at commune levels and what type of support they would require from the

provinces and districts. This would also help in the assessment of personnel required at provincial and district levels to support the CCs.

A similar study would also be required for provinces and districts, but only after their roles and responsibilities are known as a result of the implementation of the D&D strategy. At that time the potential institutional linkages between communes, districts and provinces could be re-assessed to achieve an optimal organisational arrangement for rural road management.

Options considered, preferred option and barriers: The options that were considered under this issue were: **Option 1** - do nothing; and **Option 2** – to take steps to strengthen capacities for managing roads under the responsibility of CCs immediately and to strengthen the capacities of the provincial and district offices whenever the rural road management related roles and responsibilities of the provinces and districts have become clearer during the implementation of the D&D strategy.

The selected option is Option 2 (Appendix V provides the reasons). The following provides the assessment of the barriers the implementation of Option 2 will face:

Financial: **medium**; Institutional: **high**; Legal: **low**; Technological: **low**

Human resource development

RGC's rectangular strategy has identified capacity building and human resource development as one of the top priority issues for the reform process. A recent document has identified a number of issues concerning human resource development for the Cambodia transport sector including:

(i) Although MPWT and MRD are the main actors in the management of roads in Cambodia, there is a lack of coordination between them in terms of operation and capacity building;

(ii) There has been uncoordinated capacity building in the sector due to a donor driven project approach;

(iii) There is a substantial HRD component in bilateral and multilateral funded transport development projects (ranging between 5 to 15% of projects costs) but they are poorly coordinated;

(iv) Road and transport related training requires specialist capacity in the institutions delivering the training. The supply base of training for professional development in Cambodia is very narrow. Only a handful of organisations can deliver it.

Given that a considerable number of DRR and PDRD officials do not have road related qualifications it is important to develop their capacities through appropriate and well-planned training. There is also a requirement for continuous training of the DRR and PDRD officials on the latest technological and management aspects of rural roads. In cases where local capacity is not sufficient to arrange training, foreign training will be required. However, the first step in the provision of such training would be an assessment of training needs through a training needs assessment (TNA), followed by a training gap analysis (TGA) from time to time to identify the training gaps between the new operational/business needs and current training provision in terms of knowledge, skills and attitudes.

Options considered, preferred option and barriers: The options that were considered under this issue were: **Option 1** - do nothing; and **Option 2** – taking steps to assess the human resource development needs at different levels – from MRD headquarters

to communes – and to devise a strategy to fulfil the needs with appropriate training arrangements. Analysis of training gaps from time to time would also be a part of the strategy.

The selected option is Option 2 (see Appendix V). The following provides the assessment of the barriers that the implementation of Option 2 will face:

Financial: **medium**; Institutional: **high**; Legal: **low**; Technological: **medium**

7.2 Communication and Coordination

Effective communication and coordination (C&C) within MRD, and between MRD and other stakeholders, are necessary to ensure more efficient use of scarce resources; reduce duplication of effort; coordinate activities among agencies/ministries, projects/programmes, and interested organisations; and pass on the lessons learnt from one project/programme to another. The current form of communication and coordination mechanism between MRD and other road stakeholders is ad-hoc and inefficient.

The communication process both within MRD and between MRD and its offices in the provinces and districts is far from being efficient. Apart from routine reporting (e.g. monthly and annually) from the provinces to the headquarters, there are no other channels of communication and coordination between MRD and its province and district offices. There is also no formal C&C structure between different projects within MRD, apart from occasional presentations from the project officials. Design and implementation of an improved C&C structure would help in cross-fertilisation among projects, reducing duplication of efforts and thereby helping in the better management of rural roads.

Although CCs play an important role in the management of rural roads, no C&C mechanism exists between MRD, CCs and the Ministry of Interior.

C&C between MRD and donors (and to a lesser extent other ministries involved in the sector) is in principle provided by the Technical Working Group on infrastructure and Regional Integration under the Consultative Group (CG)[13] mechanism. However, currently there is no bilateral C&C mechanism between the two main players in the transport sector, MRD and MPWT.

MRD launched a website in early 2006 as a communication tool. The website provides some information on rural roads (e.g. rural road policy, summary project information etc.). However, to make it a more effective communication tool more efforts are needed.

The summary of the above analysis is that although some form of C&C mechanism exists within MRD and between MRD and other rural road stakeholders it is far from being effective.

Options considered, preferred option and barriers: Two options were considered under this issue: **Option 1** - do nothing; and **Option 2** – seek to facilitate more effective communication and coordination within MRD, between MRD headquarters

[13] The CG mechanism has set up 17 technical groups to improve communication and coordination between ministries and donors. Each technical group is represented by interested donors and relevant ministries. For the Technical Working Group on infrastructure and Regional Integration there, are six ministries and the same number of donors, and the group is chaired by MPWT.

and its field offices, between MRD and CCs, between MRD and other ministries and between MRD and donors.

The selected option is Option 2. The following provides the assessment of the barriers to the implementation of Option 2:

Financial: **low**; Institutional: **medium**; Legal: **low**; Technological: **medium**

CHAPTER 8

STRATEGIES AND THE ACTION PLAN

Chapter 2 provided the economic justification for investment in rural roads in Cambodia, and showed how they can play an important role in the reduction of poverty and achievement of the CMDGs. Chapters 4 to 7 elaborated various issues linked to the development and maintenance of rural roads and selected best strategies to achieve the strategic objective presented in Chapter 3. This chapter summarises the selected strategies, and sets out the MRD's plan of action to implement the strategies. The Action Plan not only presents the actions but also specifies a time frame and the institutions that would be responsible for plan implementation.

8.1 Selected Strategies

The following table summarises the strategies that will be followed for each of the issues in order to achieve the strategic objective.

Issues	**Strategies**
Programming and planning	
Road law and rural roads policy	- Liaise with MPWT to seek approval of the draft Road Law. - Take immediate steps to submit the draft rural roads policy to the Council of Ministers for its approval as official government policy
Road Inventory	Start the development of a complete rural infrastructure inventory immediately, including that of roads, building on the experience gained during the implementation of the IRAP/GIS project
Geographic targeting of rural road investments	Geographically targeted capital investment in rural roads adopting the following three-pronged strategy: • Prioritisation of provinces based on three criteria: extent of poverty, agriculture development potential and the level of investment already made. • Targeting of districts within a province based on the level of poverty and quality of the rural road network; • Targeting of areas that maximise the synergy between main roads and rural roads
Road prioritisation and standard tool for road prioritisation	Use of the IRAP prioritised roads as a short-list of roads to be developed, and use of another suitable rural road prioritisation procedure in the final selection of roads that are to be developed. Use of a more simplified system for maintenance prioritisation.
Rural roads and rural water transport complementarity	Acceptance of the recommendations in the master plan for water-borne transport stud, and take actions to implement the recommendations
Rural road standards	- Acceptance and dissemination of interim rural road standards, followed by - Development and dissemination of comprehensive rural road standards
Rural transport services	Continue the current non-intervention strategy and leave to market forces to decide transport service supply levels; but initiate a study to understand more on the issue.
Participation of women in roadworks	Deliberate interventions to promote women's participation
Roadworks and environmental sustainability	Gradual development of in-house capacity to comprehensively address the issue

Issues	Strategies
Road safety	Proactively pursue road safety related issues and support other stakeholders to reduce traffic accidents on rural roads.
Rural roads and risks of spreading HIV/AIDS	Take feasible steps to reduce the risks of the spread of HIV/AIDS infections from road construction related activities, and support national HIV/AIDS awareness campaigns.
Stakeholder participation	Take steps to comprehensively address stakeholder participation issues at all stages of the project cycle.
Financing	
Improved funding for development and maintenance	Actively seek additional funding from government and international sources to improve all T, ST1, ST2 and ST3 roads within 7, 10, 15 and 20 years respectively
Division of responsibilities and the extent of improvement	• While PDRD will be responsible for the management of T and ST1 roads, Commune Councils will be responsible for ST2 and ST3 roads if such an agreement is reached between PDRDs and CCs. • Spot improvement of ST3 roads to provide basic all weather access
Sustainability	
Development of sustainable maintenance management system	Implementation of a basic maintenance system and gradual progression towards a more sophisticated system.
Overloading control	Appropriate interventions to control vehicle overloading
Involvement of private sector in development and maintenance of roads	Gradual phasing out of the involvement of the public sector from rural roadworks with the progressive development of private sector capacity.
Application of LBAT in roadworks	Proactive interventions including positive discrimination in favour of LBAT.
Surfacing of rural roads	The progressive replacement of gravel as the main surfacing option by the introduction of the best options for different traffic, physical and climatic conditions, based on the results of trials of other surfacing options
Monitoring and evaluation of rural road projects	Adopt and implement a uniform results-based M&E system and undertake appropriate actions to help implement the system.
Institutional	
Institutional strengthening	Take steps to strengthen capacities for managing roads under the responsibility of CCs immediately, and strengthen the capacities of the provincial and district offices when the rural road management related roles and responsibilities of the provinces and districts have become clearer during the implementation of the D&D strategy
Staff development	Take steps to assess the human resource development needs at different levels – from MRD headquarters to the communes – and devise a strategy to fulfil the needs with appropriate training arrangements. Analysis of training gaps from time to time will also be a part of the strategy.
Communication and coordination	Seek to facilitate more effective communication and coordination within MRD, between MRD headquarters and its field offices, between MRD and CCs, between MRD and other ministries, and between MRD and donors.

8.2 Action Plan

Strategy	Action	With assistance from		Timeframe	Indicators
		Other ministries, departments, donors	Donor assistance		
Programming and planning					
Road Law: Updating and approval of the Road Law	Liaise with MPWT for the approval of the Road Law	MPWT/Ministry of Justice		Mar.-2008	Road Law approved by the parliament
Rural road policy: Approval as official RGC policy	Submit the draft rural roads policy to the Council of Ministers	-		End- 2007	Draft policy submitted to the Council of Ministers
	RGC approval of the Rural Roads Policy	Council of Ministers		Mar. -2008	Rural Road Policy approved by RGC
Road inventory: Start the development of a complete rural infrastructure inventory immediately, including that of roads	Approach different donors for potential funding in this area	-		End-2007	Letter sent out to different donors signed by the MRD Minister
	Develop nation-wide inventory of the rural infrastructure, including rural roads	Donors	TA & financial	End-2009	Nation-wide inventory available in a spatial database
Geographical targeting: Geographical targeting of future rural roads development funds	Develop a technical note highlighting the necessity for geographical targeting and providing analysis of results	-		End-2007	A 2-page leaflet developed and distributed
	Widely disseminate the technical note by distributing it among different stakeholders and uploading it on the MRD website	-		Mar.-2008	The technical note is distributed and uploaded on the MRD website
Road prioritisation: IRAP identified roads will be considered as a short-list of roads and the roads will be prioritised using a prioritisation tool	Identify/develop a prioritisation tool suitable for Cambodia rural roads that takes into consideration economic, social and environmental costs/benefits	Donors	TA	Mar.-2008	A study report on tool for road prioritisation published
	Pilot the prioritisation tool in a province, including training of MRD officials	Donors	TA	Mid-2008	Officials from a province trained and roads selected for development and maintenance using the

Strategy	Action	With assistance from		Timeframe	Indicators
		Other ministries, departments, donors	Donor assistance		
					tool
	Roll out the training programme and extend the use of the tool to other provinces	Donors	TA	End-2009	Officials from other provinces trained and roads selected using the tool
Road and RWT complementarity: Proactive actions to improve complementarity between rural water and land transport	Review and accept the rural water transport related recommendations of the master plan for waterborne transport in Cambodia study	-		End-2007	Meeting minutes showing such acceptance
	Develop a handbook on the integration of rural water transport in the rural road development plan	Donors	TA	Mid-2008	A handbook developed
	Contact MPWT regarding assigning rural water transport related responsibilities to MRD	-		End- 2007	Letter sent to MPWT
	Issue an inter-ministerial declaration on the assignment of rural water transport related responsibilities to MRD	MPWT		Mid-2008	Order issued
	Review and improve the rural water transport related section in the draft rural road policy	-		2007	A section on RWT inserted in the rural road policy
Rural road standards: Development and dissemination of rural road standards	Approve the interim rural road standards	-		Sep. 2007	Interim rural road standards approved by the MRD Minister
	Prepare a technical brief on the standards	DFID	TA	End-2007	A technical brief prepared
	Widely disseminate the interim standards	-		Mar. 2008	• A technical brief circulated among different stakeholders • Technical brief uploaded on the MRD website
	Develop the final standards with external	Donor (DFID)	TA	End-2008	▪ Final technical

Strategy	Action	With assistance from		Timeframe	Indicators
		Other ministries, departments, donors	Donor assistance		
	assistance (potentially with DFID support)				standards developed by end-2008 ▪ The standards are presented in a stakeholder meeting by Mar. 2009 ▪ Final rural road standards approved by the MRD Minister by mid-2009
	Widely disseminate the Technical standard	Donor (DFID)		2008	▪ Technical Brief on the rural road standards prepared ▪ Technical brief is circulated among different stakeholders ▪ Technical standard document is uploaded on the MRD website
Transport services: Continue current strategy of non-intervention in transport services for the short-term, but initiate actions to gather empirical evidence on the issue in the Cambodian context	Explore the potential for conducting a study to establish the link between development of roads and increased mobility of rural population, especially the poor	-		Mid-2008	Issues raised with different donors
	Conduct a study to establish the link between development of roads and increased mobility of rural population, especially the poor	Donors	TA	By end-2009	A study initiated by 2009 if funding is available
Women & roadworks: Deliberate intervention to promote women's participation in roadworks	Include the gender and rural roads issue in the rural road policy	-		End-2007	Issue included in the revised rural road policy
	Consult with Ministry of Women's & Veteran's Affairs and agree to different threshold levels for different types of roadworks for women's participation in	MWAJ		Mid-2008	An inter-ministerial declaration published

Strategy	Action	With assistance from		Timeframe	Indicators
		Other ministries, departments, donors	Donor assistance		
	roadworks				
	Insert a clause in the standard contract document on the use of women in roadworks	-		End-2008	A clause inserted in the standard contract document
Roadworks and environmental sustainability: Gradual development of in-house capabilities for environmental assessments, implementation and monitoring to ensure sustainability of the interventions	Rename the Road Safety Section under the monitoring and evaluation office of the DRR as Environmental and Road Safety Section and designate appropriate staff to deal with the issue	-		End-2007	An order renaming the section is issued and staff assigned to deal with the issue
	Approach donors for technical assistance to develop environmental assessment related manuals and training	-		Mid-2008	Letters sent out to donors with request for TA
	Develop manuals for conducting road related Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA)	Donors	TA	Mid-2009	Manuals available for distribution
	Train headquarters and PDRD officials on IEE and EIA using the manuals	Donors	TA & Financial	Mid-2010	A number of headquarters and PDRD officials trained
	Issue instructions to conduct environmental examinations and to take necessary mitigation measures before improvement of rural roads	-		2010	Instructions issued
	Monitor on a sample basis every year whether the instructions have been adhered to or not	-		Every year	Monitoring report available
Road safety	Arrange a rural road safety seminar to be attended by different stakeholders (e.g. local government bodies, relevant ministries, NGOs) in order to map out actions needed by MRD to address the rural road safety issues	MPWT/MoI/Donors	Financial	End-2008	Seminar proceedings available
	Take actions as recommended by the seminar	-		2009 onward	Actions recommended in the seminar taken

Strategy	Action	With assistance from		Timeframe	Indicators
		Other ministries, departments, donors	Donor assistance		
HIV/AIDS:	Draft and include clauses in all major contract documents that requires contractors to provide health education to workers and to distribute condoms			Mid-2008	HIV/AIDS mitigation measures clauses included in the standard contract
Stakeholder participation:	Develop comprehensive stakeholder participation guidelines to ensure participation by stakeholders at different stages of the rural road project cycle	Donors	TA	End-2008	Guidelines prepared
	Train relevant officials on participation issues and on the guidelines	Donors	TA	Mid-2009	Officials trained
	Ensure that the stakeholders participated at different stages of rural road projects	-		End-2009 onward	Project report
Financing					
Funding: Mobilisation of funds for development and maintenance of rural roads as per Scenario 3's rate of improvement	Launch the strategic plan in a meeting attended by donors and other stakeholders	-		End-2007	Meeting held
	Arrange a meeting with donors and other ministries/stakeholders	MEF/donors	Financial	Mar. 2008	Meeting held
	Agree to a modality to share maintenance funding	MPWT/MEF		Mar.-2008	An inter-ministerial declaration issued
Sustainability					
System for maintenance management: Implementation of a basic maintenance system and gradual progression towards a more sophisticated system	Independent assessment of the rural road maintenance management system in Cambodia and suggest best potential system including demonstration of the system in a province potentially with the help of a development partner (e.g. DFID)	Donors	TA	End-2007	Independent evaluation report available including the results of the demonstration outcome
	Pilot the system under a project (potentially under TRIP)	TRIP IV	TA	Mid-2008	Report on using the system is available
	Report the successes and failures to other stakeholders (e.g. MEF, MPWT, donors, CCs) from experience of using the system in TRIP districts	TRIP IV	TA	End-2008	A meeting of different stakeholders held
	Train PDRD and Commune Council	TRIP IV	TA and	Mid-2009	Training held

Strategy	Action	With assistance from		Timeframe	Indicators
		Other ministries, departments, donors	Donor assistance		
	officials in the use of the maintenance management system		financial		
	Roll out the system in other provinces	TRIP IV	TA and financial	Mid-2010	System used by different provinces
	Improve the system by linking it with GIS data (spatial and attribute) available from the infrastructure inventory exercise	Donors	TA	End-2011	System improved with GIS data
Overloading control: Selection and implementation of appropriate interventions to control overloading	With MPWT arrange a seminar/meeting on overloading to be attended by different stakeholders, including the truckers, with an objective to find practical solutions on overloading	MPWT/Donors	TA	Mid-2008	Meeting minutes produced with the recommendations
	Take appropriate actions on the basis of the recommendations of the meeting/seminar	-		Jul. 2008 onward	Report(s) elaborating the steps taken to control overloading and its effects
Roadworks and Private sector: Gradual phasing out of the public sector from roadwork implementation with the development of the private sector	Conduct a study to evaluate the capacity of the local contracting and consulting industry and to estimate the proportion of rural road development and maintenance roadworks that can be allocated to local contractors and consultants, to provide a time frame for the gradual phasing out of the public sector from roadwork implementation	Donor	TA	Mid-2008	Study conducted and report accepted
	Prepare an action plan for implementation of the study recommendations	Donor	TA	Mid-2008	Action plan prepared as a part of the study
	Implement the action plan			As per action plan	Actions taken as per the action plan
Roadworks and technology choice: Proactive intervention including positive discrimination in the use of Labour-based Appropriate Technology (LBAT)	Include the issue of LBAT in the local construction industry study to simultaneously evaluate the capacity of the local construction and consulting industry in the planning and implementation of	Donor	TA	Mid-2008	Study report evaluated the capacity of local construction industry in the planning and implementation of

Strategy	Action	With assistance from		Timeframe	Indicators
		Other ministries, departments, donors	Donor assistance		
	LBAT				LBAT roadworks
	Prepare a separate LBAT action plan for implementation of the study recommendations	Donor	TA	Mid-2008	Study prepared a separate action plan for LBAT
	Implement the action plan	-	TA	As per action plan	Actions taken as per the LBAT action plan
Road surfacing: The progressive replacement of gravel as the main surfacing option by the selection of the most appropriate surface in relation to traffic, physical and climatic conditions	Develop interim guidelines for choosing alternative surfacing options based on the currently available SEACAP and other study results (e.g. Mozambique study)	Donors	TA	End-2007	Guidelines developed
	Use the guidelines in the selection of road surfaces	-		Mid-2008	PDRDs used the guidelines in selection of appropriate surfaces for T roads
	Develop comprehensive guidelines for the design and selection of appropriate road surfaces based on final SEACAP study results	Donors (DFID)	TA	2009	Comprehensive guidelines developed
	Use the comprehensive guidelines in the design and selection of road surfaces	-		2011 and 2016	Minimum 25% and 50% of the T roads have alternative surfaces by 2011 and 2016 respectively
Monitoring and evaluation:	Develop a list of core outcome indicators that will be monitored by MRD in order to assess the effectiveness of rural road interventions	Donors	TA	Mid-2008	A list of outcome indicators available
	While conducting the institutional study (see below) include proposals for strengthening the M&E Office of DRR in order to sustainably carry out its M&E related responsibilities	Donors	TA	End-2009 (potentially)	Tasks included in the ToR and study recommendations on M&E are available
	Take actions as per the institutional study recommendations			Jan-2010 onward	Actions taken as per the study recommendations

Strategy	Action	With assistance from		Timeframe	Indicators
		Other ministries, departments, donors	Donor assistance		
Institutional					
Institutional Strengthening: Take steps to strengthen capacities for managing roads under the responsibility of local government institutions immediately, and further strengthen the capacities of the provincial and district offices whenever the rural road management related roles and responsibilities of the provinces and districts have become clearer during the implementation of the D&D strategy	Conduct a study to recommend steps to improve the development and management capacities for roads at different local government levels. The study should recommend the roles CCs, districts and provinces can play in the development and management of roads a including the potential manpower requirements	Donors	TA	Mid-2008	Study report available
	Review the study recommendations and take actions to implement the feasible recommendations	Ministry of Interior		End-2008 onward	Actions taken to implement the recommendations
	Conduct a study to improve the road management capacities at the MRD headquarters, provincial and district levels, including proposals for institutional strengthening	Donors	TA	End-2009 (potentially)	Study report available
	Review the study recommendations and take actions to implement the feasible recommendations			2010 onward	Actions taken to implement the recommendations
Human resource development: Take steps to assess the human resource development needs at different levels – from MRD headquarters to the communes – and to devise a strategy to fulfil the needs with appropriate training arrangements	Carry out a training needs assessment (TNA) at different levels (for MRD headquarters, provincial, district, commune staff) to increase the staff capacity for planning and management of rural roads. The study output should include an action plan to implement the proposals	Donors	TA	End-2008	Study conducted and report available
	Develop a detailed training plan and training module based on the recommendations of the TNA study	Donors	TA	Mid-2009	Detailed training plan and training module available
	Carry out training at different levels as per the TNA study action plan	Donors	TA, Financial	Jul 2009 onward	Training conducted
Communication and Coordination: Seek	Create a permanent Working Group within	-	-	End-2007	Order issued forming a

Strategy	Action	With assistance from		Timeframe	Indicators
		Other ministries, departments, donors	Donor assistance		
to facilitate more effective communication and coordination within MRD, between MRD headquarters and its field offices, between MRD and CCs, between MRD and other ministries and between MRD and donors	MRD to deal with the rural road issues				permanent working group by the MRD Minister
	Assign a representative, not below the rank of Director General, to represent MRD in the Technical Working Group on infrastructure and Regional Integration	-	-	End-2007	Order issued my the MRD Minister
	Arrange a meeting of stakeholders involved in rural road development and maintenance (MRD, MPWT, MEF, MOP, MoI and other ministries, PDRD, DORD, CCs, donors) in order to make recommendations	MPWT/MEF/MoP/MoI and other relevant ministries	TA	Mid-2008	Meeting held and meeting minutes available
	Prepare an action plan to implement the meeting recommendations	-		Mid-2008	Action plan prepared
	Implement the recommendations	-		July 2008 and onward	Actions taken as per the action plan

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APPENDIX I: LENGTH AND CONDITION OF RURAL ROADS

SUMMARY BY PROVINCE

Province	Length (km)					Road Surface (km)			Surface Condition (km)	
	T	ST1	ST2	ST3	Total	Paved	gravel/ laterite	earth	Good to Fair	Poor
Banteay Meanchey	78	20	156	1,527	**1,781**	0	513	1,269	513	1,269
Battambang	234	103	257	2,054	**2,649**	0	716	1,934	716	1,934
Kampong Cham	301	468	182	659	**1,609**	0	1,609	0	301	1,308
Kampong Chanang	86	129	400	254	**869**	0	552	317	111	758
Kampong Speu	148	31	103	80	**361**	0	361	0	0	361
Kampong Thom	74	28	398	953	**1,454**	0	970	484	525	929
Kampot	0	125	376	503	**1,004**	0	878	126	187	818
Kandal	42	70	370	1,397	**1,879**	0	187	1,692	0	1,879
Koh Kong	0	83	39	130	**252**	0	140	111	140	111
Kratie	144	45	19	5	**213**	0	183	31	0	213
Mondul Kiri	0	0	47	463	**510**	0	0	510	0	510
Preah Vihear	0	0	249	0	**249**	0	146	103	0	249
Prey Veng	108	35	190	154	**486**	0	424	62	460	26
Pursat	137	137	150	972	**1,396**	0	548	849	71	1,325
Rotanak Kiri	0	233	19	439	**691**	0	0	691	0	691
Siemreap	228	108	196	3,537	**4,069**	0	306	3,763	306	3,763
Sihanoukville	71	0	45	205	**321**	0	189	132	150	170
Stung Treng	69	344	88	393	**894**	0	109	785	0	894
Svay Rieng	183	117	138	77	**514**	0	82	432	26	489
Takeo	0	271	175	884	**1,330**	0	948	382	304	1,026
Oddar Meanchey	0	31	85	727	**843**	0	95	748	95	748
Kep	0	15	58	21	**94**	0	27	67	15	79
Pailin	69	257	28	25	**379**	0	340	38	16	363
Phnom Penh	0	0	182	0	**182**	0	129	53	0	182
Total:	**1,972**	**2,651**	**3,949**	**15,456**	**24,028**	**0**	**9,452**	**14,576**	**3936**	**20,095**

BY PROVINCE AND ROAD TYPE

Province	Road Type	Length (km)	Length by Existing Surface (km)			Length by condition (km)	
			Paved (bitum.)	Laterite	Earth	All Weather	Dry Weather
Banteay Meanchey	Tertiary	78	-	70	8	70	8
	ST1	20	-	15	4	15	4
	ST2	156	-	109	47	109	47
	ST3	1,527	-	318	1,209	318	1,209
	Sub-total	**1,781**	**-**	**513**	**1,269**	**513**	**1,269**
Battambang	Tertiary	234	-	37	198	37	198
	ST1	103	-	72	31	72	31
	ST2	257	-	148	109	148	109
	ST3	2,054	-	459	1,595	459	1,595
	Sub-total	**2,649**	**-**	**716**	**1,934**	**716**	**1,934**
Kampong Cham	Tertiary	301	-	301	-	301	-
	ST1	468	-	468	-	-	468
	ST2	182	-	182	-	-	182
	ST3	659	-	659	-	-	659
	Sub-total	**1,609**	**-**	**1,609**	**-**	**301**	**1,308**
Kampong Chanang	Tertiary	86	-	86	-	-	86
	ST1	129	-	78	52	78	52
	ST2	400	-	234	165	17	382
	ST3	254	-	153	100	16	238
	Sub-total	**869**	**-**	**552**	**317**	**111**	**758**
Kampong Speu	Tertiary	148	-	148	-	-	148
	ST1	31	-	31	-	-	31
	ST2	103	-	103	-	-	103
	ST3	80	-	80	-	-	80
	Sub-total	**361**	**-**	**361**	**-**	**-**	**361**
Kampong Thom	Tertiary	74	-	74	-	55	19
	ST1	28	-	28	-	-	28
	ST2	398	-	398	-	75	323
	ST3	953	-	469	484	394	558
	Sub-total	**1,454**	**-**	**970**	**484**	**525**	**929**
Kampot	Tertiary	-	-	-	-	-	-
	ST1	125	-	125	-	47	78
	ST2	376	-	341	35	-	376
	ST3	503	-	412	91	140	363
	Sub-total	**1,004**	**-**	**878**	**126**	**187**	**818**
Kandal	Tertiary	42	-	42	-	-	42
	ST1	70	-	66	4	-	70
	ST2	370	-	46	323	-	370

Province	Road Type	Length (km)	Length by Existing Surface (km)			Length by condition (km)	
			Paved (bitum.)	Laterite	Earth	All Weather	Dry Weather
	ST3	1,397	-	33	1,364	-	1,397
	Sub-total	**1,879**	**-**	**187**	**1,692**	**-**	**1,879**
Koh Kong	Tertiary	-	-	-	-	-	-
	ST1	83	-	52	31	52	31
	ST2	39	-	18	21	18	21
	ST3	130	-	70	59	70	59
	Sub-total	**252**	**-**	**140**	**111**	**140**	**111**
Kratie	Tertiary	144	-	144	-	-	144
	ST1	45	-	19	26	-	45
	ST2	19	-	19	-	-	19
	ST3	5	-	-	5	-	5
	Sub-total	**213**	**-**	**183**	**31**	**-**	**213**
Mondul Kiri	Tertiary	-	-	-	-	-	-
	ST1	-	-	-	-	-	-
	ST2	47	-	-	47	-	47
	ST3	463	-	-	463	-	463
	Sub-total	**510**	**-**	**-**	**510**	**-**	**510**
Preah Vihear	Tertiary	-	-	-	-	-	-
	ST1	-	-	-	-	-	-
	ST2	249	-	146	103	-	249
	ST3	-	-	-	-	-	-
	Sub-total	**249**	**-**	**146**	**103**	**-**	**249**
Prey Veng	Tertiary	108	-	108	-	92	16
	ST1	35	-	35	-	25	10
	ST2	190	-	190	-	190	-
	ST3	154	-	92	62	154	-
	Sub-total	**486**	**-**	**424**	**62**	**460**	**26**
Pursat	Tertiary	137	-	38	98	29	108
	ST1	137	-	55	82	6	131
	ST2	150	-	87	63	10	140
	ST3	972	-	367	606	26	947
	Sub-total	**1,396**	**-**	**548**	**849**	**71**	**1,325**
Rotanak Kiri	Tertiary	-	-	-	-	-	-
	ST1	233	-	-	233	-	233
	ST2	19	-	-	19	-	19
	ST3	439	-	-	439	-	439
	Sub-total	**691**	**-**	**-**	**691**	**-**	**691**
Siemreap	Tertiary	228	-	82	146	82	146
	ST1	108	-	74	34	74	34
	ST2	196	-	59	137	59	137
	ST3	3,537	-	91	3,446	91	3,446

Province	Road Type	Length (km)	Length by Existing Surface (km)			Length by condition (km)	
			Paved (bitum.)	Laterite	Earth	All Weather	Dry Weather
	Sub-total	**4,069**	**-**	**306**	**3,763**	**306**	**3,763**
Sihanoukville	Tertiary	71	-	71	-	32	38
	ST1	-	-	-	-	-	-
	ST2	45	-	27	18	27	18
	ST3	205	-	91	115	91	115
	Sub-total	**321**	**-**	**189**	**132**	**150**	**170**
Stung Treng	Tertiary	69	-	69	-	-	69
	ST1	344	-	-	344	-	344
	ST2	88	-	8	80	-	88
	ST3	393	-	32	361	-	393
	Sub-total	**894**	**-**	**109**	**785**	**-**	**894**
Svay Rieng	Tertiary	183	-	33	149	26	157
	ST1	117	-	40	77	-	117
	ST2	138	-	-	138	-	138
	ST3	77	-	8	69	-	77
	Sub-total	**514**	**-**	**82**	**432**	**26**	**489**
Takeo	Tertiary	-	-	-	-	-	-
	ST1	271	-	271	-	257	14
	ST2	175	-	163	12	16	159
	ST3	884	-	514	370	31	853
	Sub-total	**1,330**	**-**	**948**	**382**	**304**	**1,026**
Oddar Meanchey	Tertiary	-	-	-	-	-	-
	ST1	31	-	18	13	18	13
	ST2	85	-	12	73	12	73
	ST3	727	-	65	662	65	662
	Sub-total	**843**	**-**	**95**	**748**	**95**	**748**
Kep	Tertiary	-	-	-	-	-	-
	ST1	15	-	15	-	15	-
	ST2	58	-	12	45	-	58
	ST3	21	-	-	21	-	21
	Sub-total	**94**	**-**	**27**	**67**	**15**	**79**
Pailin	Tertiary	69	-	69	-	5	64
	ST1	257	-	219	38	-	257
	ST2	28	-	28	-	7	21
	ST3	25	-	25	-	5	20
	Sub-total	**379**	**-**	**340**	**38**	**16**	**363**
Pnom Penh	Tertiary	-	-	-	-	-	-
	ST1	-	-`	-	-	-	-
	ST2	182	-	129	53	-	182
	ST3	-	-	-	-	-	-
	Sub-total	**182**	**-**	**129**	**53**	**-**	**182**

Province	Road Type	Length (km)	Length by Existing Surface (km)			Length by condition (km)	
			Paved (bitum.)	Laterite	Earth	All Weather	Dry Weather
Overall	**Tertiary**	**1,972**	**-**	**1,373**	**599**	**729**	**1,243**
	ST1	**2,651**	**-**	**1,682**	**968**	**659**	**1,992**
	ST2	**3,949**	**-**	**2,460**	**1,489**	**689**	**3,261**
	ST3	**15,456**	**-**	**3,937**	**11,520**	**1,859**	**13,597**
	Total	**24,028**	**-**	**9,452**	**14,576**	**3,936**	**20,092**

Note: ST1- Sub-tertiary Road Type 1; ST2- Sub-tertiary Road Type 2; ST3- Sub-tertiary Road Type

APPENDIX II: DEVELOPMENT OF RURAL ROAD NETWORK UNDER DIFFERENT FOREIGN FUNDED PROJECTS

Project Name	Funded by	Start	Complete	Project Costs (m $US)	Roads Improved (km)	Roads maintained (km)	Type of roads improved	Comments
ILO Upstream Project	Sida/ Upstream Project	Jul '98	Dec '02	7.3	11	490	T, ST1, ST2, ST3	Province: Siemreap, Battambang and Banteay Meanchey
WFP	USA, Japan and Australia	Mar '96	On-going	5000 Tonnes of rice (approx.)	500 per year (approx.)	None	ST1, ST2 and ST3	Province: Kampong Cham, Kampong Chanang, Kampong Thom, Prey Veng, Svay Rieng, Takeo, Kampot, Kandal, Banteay Meanchey, Siemreap and Oddar Meanchey
Flood Emergency Rehabilitation Project (FERP)	WB, Credit No. 3472-Kh	Jun '01	Jun '05	8.2	567	None	T, ST1, ST2,ST3 and DBST on Tertiary road	Province: Prey Veng, Svay Rieng, Kampong Cham, Kratie, Rotanak Kiri, Kandal, Takeo, Kampong Thom, Kampong Speu, Koh Kong, Kampong Chanang, Pursat, Battambang, Siemreap, Banteay Meanchey, Pailin, Kampot and Phnom Penh
Emergency Flood Rehabilitation Project (EFRP)	ADB, Loan No.1824, CAM-(SF)	Dec '00	Dec '03	6.2	558	74 (RM)	T, ST1, ST2 and ST3	Province: Phnom Penh, Kandal, Takeo, Kampong Thom, Kampong Speu, Sihanoukville, Kampong Cham, Kampot, Kratie, Kampong Chanang, Prey Veng, Svay Rieng, Battambang, Banteay Meanchey and Siemreap
Rural Infrastructure Improvement Project (RIIP)	ADB, Loan No.1385, CAM-(SF)	Jan '96	Apr '03	31.5	605	195 (PM) and 1713 (RM)	T, ST1, ST2 and ST3	Province: Kandal, Takeo, Kampot, Kampong Cham, Prey Veng and Svay Rieng

Project Name	Funded by	Start	Complete	Project Costs (m $US)	Roads Improved (km)	Roads maintained (km)	Type of roads improved	Comments
Steung Chinet	WB, Credit No. 1753-Kh	Aut '02	On-going (Jun '06)	2.9	58	48 (RM)	ST2	Province: Kampong Thom and Kampot
Community Based Rural Development Project (Source IFAD)	IFAD-Loan WB	Apr '01	Mar '08	1.6	200	N/A	T, ST1, ST2 and ST3	Province: Kampong Thom and Kampot
Tertiary Rural Infrastructure Programme (TRIP) Phase I, II & III & Flood Repair Programme	KfW/World Food Programme	1992	'05	13.3	1,423	1450	T and ST1	Province: Kampong Cham, Kampong Chanang, Kampong Thom, Kampong Speu, Prey Veng, Kratie, Kampot
Tertiary Rural Infrastructure Programme (TRIP) Phase IV	KfW	2005	2007	12.1	250		Tertiary Road	Province: Kampong Cham, Kampong Chanang, Kampong Thom, Kampong Speu, Prey Veng, Kratie, Svay Rieng
Provincial Rural Infrastructure Project (PRIP)	World Bank	Mar '04	Mar '07	7.2	200	317 (RM) and 100 (PM)	Secondary national road and tertiary road	Province: Siemreap, Preah Vihear, Kampong Thom and Oddar Meanchey

Project Name	Funded by	Start	Complete	Project Costs (m $US)	Roads Improved (km)	Roads maintained (km)	Type of roads improved	Comments
NRDP (Northwestern Rural Development Project)	ADB	Mar '03	Dec 2007	34.7	600	N/A	T, ST1, ST2 and ST3	Province: Siemreap, Banteay Meanchey, Battambang, Oddar Meanchey

Note: T- Tertiary Road; ST1=Sub-tertiary Road Type 1; ST2=Sub-tertiary Road Type 2; ST3=Sub-tertiary Road Type 3; RM – Routine Maintenance; PM – Periodic Maintenance

APPENDIX III: POTENTIAL ROLE OF RURAL ROADS/TRANSPORT IN ACHIEVEMENT OF CMDGs

This appendix expands the discussion in chapter 2 on the links between rural roads/transport and the achievement of the CMDGs. Goal 8, global partnership for development, is excluded from the discussion on the grounds that there are no meaningful links whether positive or negative.

CMDG 1 - eradicate extreme poverty and hunger: Although economic growth is a pre-condition of development, it is by no means the only pre-condition for poverty reduction. The poor benefit from economic growth only if they can exploit the economic and social opportunities that are linked to that growth. Therefore, it is necessary to achieve pro-poor growth to have a major impact on poverty, and CMDG 1 is set in this context.

Cambodia has established eight indicators to assess the achievement of CMDG 1 including a reduction in the proportion of people below the national and food poverty lines, and equity in consumption. A recent review (MoP, 2005) on the achievements of CMDGs indicates that the rates of reduction of people below these poverty lines are improving, but the rates are below the targets; and Knowles (2005) and MoP (2005) have indicated a worsening in the equity situation in Cambodia.

Section 2.2 presented evidence from a number of international studies that directly link investment in rural roads and a reduction in poverty and inequality. The links work through providing the rural poor with greater access to markets and employment opportunities. Rural roads also reduce transport costs and improve market access for enterprises and service providers, bringing further indirect benefits.

CMDG 2 - Universal primary education: There are ten indicators for CMDG 2 including increases in net enrolment rate and ratios, and increases in the ratios of girls to boys in primary and secondary education. MoP (2005) indicates that the situation regarding net admission rate remains static. However, net enrolment ratios for both boys and girls, and the ratios of girls in primary and secondary schools, have improved but are still below target.

Evidence from Vietnam suggests that roads have a bigger impact on secondary school enrolment, than primary enrolment, as the distances to secondary schools are typically greater than primary schools. (Doeolalikar, 2001). TRIP (2002) has reported an increase in the number of students going to schools after the rehabilitation of roads and, in particular, female students going to secondary schools. TRIP (2004) has identified reduced travel time as one of the reasons for higher school enrolment. Therefore, an improved rural road network will help in the achievement of CMDG 2.

CMDG 3 – Gender equality and empower women: CMDG 3 has twenty indicators that range from the ratio of girls to boys in upper secondary schools to the proportion of female ministers. The worst performing indicators include the ratio of females in tertiary education, ratio of illiteracy of females under different age groups, female share in wage employment in services, and population percentage aware that violence against women is wrongful behaviour and a criminal act. It is difficult to prove with certainty the relationship between rural road development and gender equality and women's empowerment, but TRIP (2004) found that improved roads encourage women to travel further distances in search of work. Also the evidence presented for

CMDG 2 has shown that rural road improvement encourages girls' schooling and is thereby expected to help with gender equality and women's empowerment.

In the TRIP project area the frequency of visits by government and NGO workers increased after the construction of roads (TRIP, 2002), and there has been an improvement in communication between villagers and the government and NGO field workers. Such interactions increase awareness among villagers, including women, about their rights and responsibilities. Transport might therefore play a complementary role in the achievement of gender equality and the empowerment of women.

CMDG 4 & 5 – Reduce child mortality, improve maternal health: CMDG 4 & 5 have 7 and 9 indicators respectively, including under-five and infant mortality rates, maternal mortality ratio, and proportion of births attended by skilled health personnel. All the indicators of CMDG 4 have either been achieved or arenon target. The main underachieving CMDG 5 indicators include the proportion with two or more Anti Natal Care consultations from skilled health personnel. Evidence suggests that road improvement improves physical access to health facilities, so that villagers, especially women, visit health facilities more frequently (TRIP, 2002). Improved roads also encourage more health workers to visit the villages more frequently. An empirical study in Vietnam has concluded that there is a strong positive effect between the presence of a road in the village and the utilisation of public health facilities (Doeolalikar, 2001). The study concluded that better roads improve access to health facilities and therefore their usage. Therefore, the conclusion can be made that the improvement of the rural road network would help in the achievement of some of the worst performing indicators of CMDG 4 and 5.

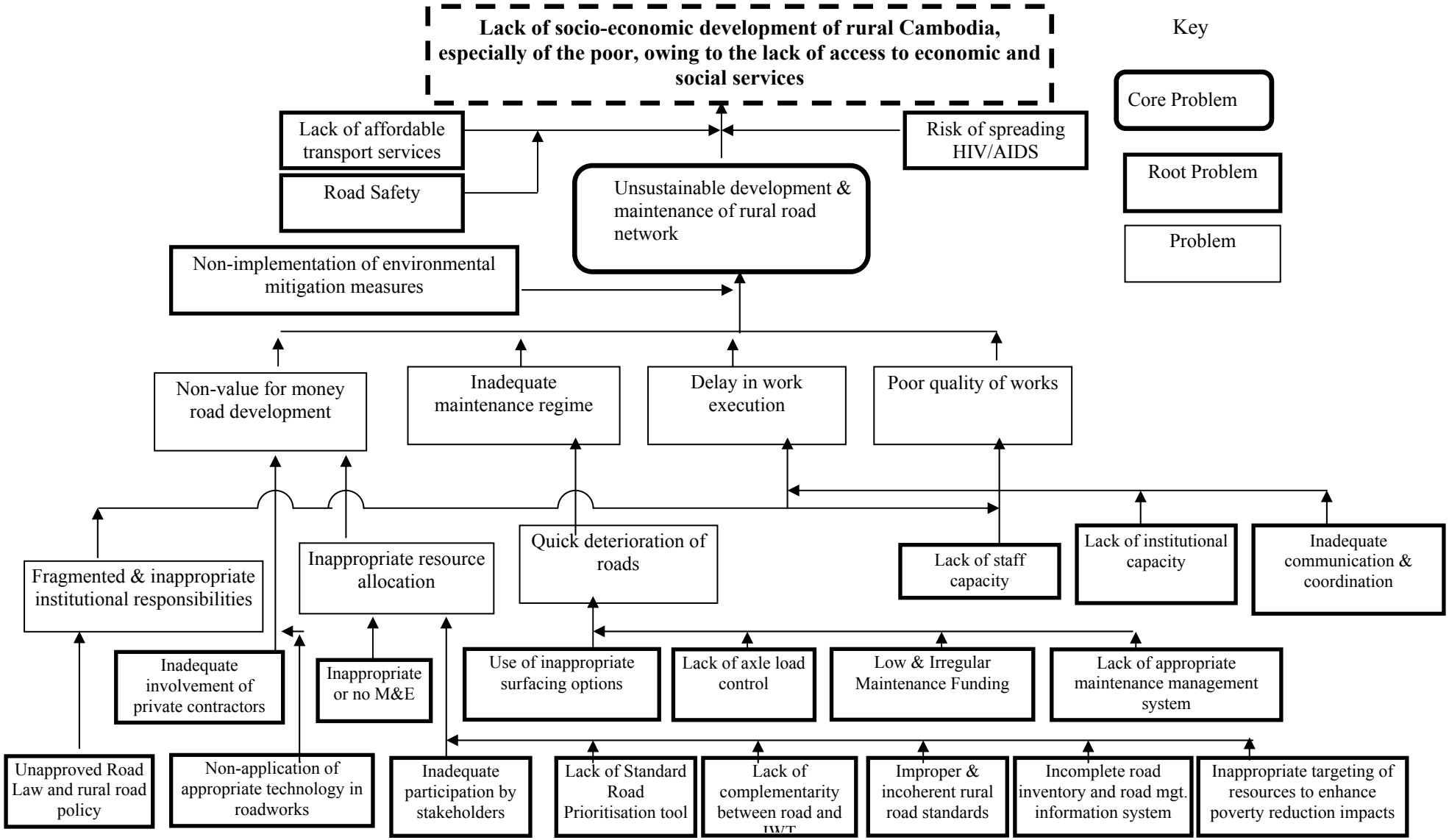
CMDG 6 – Combat HIV/AIDS, malaria and other diseases: There are 17 indicators for CMDG 6. MoP (2005) classified the progress of five indicators as good but still below target. They include the proportion of population at high risk that sleep under insecticide-treated nets, number of dengu cases treated by the public health sector, and proportion of TB cases detected. Improved rural transport can improve access to health facilities (see above), but can also facilitate the spread of infectious diseases, including HIV/AIDS, into rural areas. There are several short term links between the improvement of rural roads and the spread of HIV/AIDS (e.g. migrant workers working on a rural road project are vulnerable to contracting HIV/AIDS) and long term links (e.g. operators of passengers and freight transport services are known to be a high-risk HIV/AIDS group because of their itinerant lifestyle). However, careful incorporation of measures to mitigate the risk of increasing of the incidence HIV/AIDS during road improvement planning will offset such a risk. Also TRIP (2002) found that there had been an increase in training activities, including health related training, by government and NGO workers after the improvement of roads. Such activities should increase the awareness of rural residents about infectious diseases. With the potential of a reduction of travel time to health facilities after the road improvement and an increase of rural people using public health facilities, rural road improvement might help to achieve some of the indicators under CMDG 6.

CMDG 7 – Ensure environmental sustainability: CMDG 7 has eight indicators. One of the poorly performing indicators is the fuel wood dependency of households. Improvement of the rural road network may help in the achievement of this indicator as the villagers with improved road will have easy access to alternative energy sources. Also the risk of environmental degradation (e.g. loss of agricultural land or

felling of trees) due to the improvement of rural roads should be negligible given that the overwhelming majority of improved rural roads have existing alignments. MRD and Seila (2004) reported that rural roads construction did not have any significant negative environmental impacts. The only negative impacts reported are accidents and traffic related dust.

CMDG 9 - de-mining, UXO and victim assistance: Improved rural roads may help in the achievement of CMDG 9 by facilitating personnel and equipment access to remote areas with mines.

APPENDIX IV: LINKS BETWEEN ISSUES AND STRATEGIC OBJECTIVES



APPENDIX V: ISSUES, OPTIONS AND REASONS FOR CHOOSING AN OPTION

Issues	Chosen Option	Other options considered	Reasons for the choice
Programming and planning			
Road law, Transport Policy and Rural Road Policy	• Taking immediate steps to submit the draft rural roads policy to the Council of Ministers for its approval, and liaising with MPWT to seek approval of the Road Law with any necessary amendments	• Delaying submission of the draft rural roads policy to the Council of Minsiters so that further refinements can be made.	• The rural roads policy has been worked on since 1998, and needs to be finalised as official RGC policy (plus the Road Law when possible). • The present draft policy has been developed in consultation with stakeholders.
Road Inventory and road management information system	• Start the development of a complete rural infrastructure inventory immediately, including that of roads, building on the experience gained during the implementation of the IRAP/GIS project	• Progressively develop a complete rural infrastructure inventory under different rural infrastructure projects as done in four provinces under NRDP.	• Given that information on the network size and conditions is one of the first requirements for any sensible road planning system, the completion of rural road inventory is essential.
Geographical targeting of future capital investment	• Objective investment targeting using the following three-pronged strategy: o Prioritisation of provinces based on three criteria: extent of poverty, agriculture development potential and the level of investment already made. o Targeting of districts within a province based on the level of poverty and quality of the rural road network; o Targeting of areas that maximises synergy between main roads and rural roads	• Prioritisation of provinces on the basis of extent of poverty only • No objective targeting	• Will benefit the poor and areas with agriculture potential and low level of rural road development; • Will increase synergy between main road and rural road investments
Road prioritisation and standard tool for road prioritisation	• To use the IRAP prioritised roads as a short-list of roads to be developed and another prioritisation procedure in the final selection of roads that are to be developed. ROMAPS will be used in	• To develop the roads on the basis of the IRAP developed plan. • To use the IRAP prioritised roads as a short-list of roads to be developed and another prioritisation procedure iin the	• Better option for prioritisation under resource constraints; • Will help ensure appropriate allocation of resources; • Given that there exists substantial

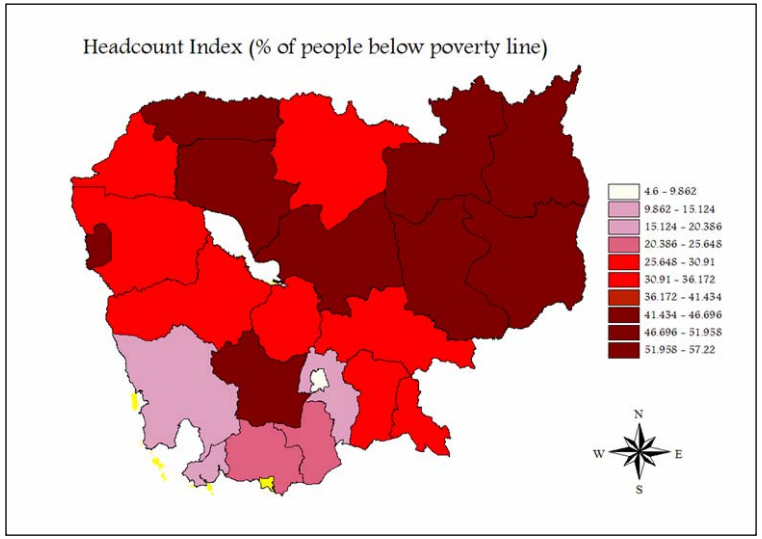
Issues	Chosen Option	Other options considered	Reasons for the choice
	maintenance prioritisation	final selection of roads that are to be developed or maintained.	ROMAPS experience within MRD, and with the implementation of TRIP IV there will be enhanced experience, use of ROMAPS in maintenance prioritisation is preferable.
Rural roads and rural water transport complementarity	• Accept master plan for water-borne transport study recommendations and take action to implement them.	• continue current non-intervention strategy	• will increase inter-modal harmonisation. • Will help in improved travel and transport for the rural poor.
Rural road standards	• Accept and disseminate the newly developed standards.	• Do nothing	• There is a need to develop uniform rural road standards. • The newly developed standards are simple and straightforward.
Rural transport services	• Continue the current non-intervention strategy and leave the supply of transport services to market forces alone.	• Develop detailed rural transport service related policies and strategies supported by a detailed study regarding the availability and use of rural transport services by the rural population, especially the rural poor, to serve their access and mobility needs	• It appears that market forces are the best way to tackle this issue. • There is no evidence that the transport services market is distorted in a way that requires interventions.
Participation of women in roadworks	• Deliberate interventions to promote women's participation.	• Do-nothing, leaving it to market forces	• More employment opportunities for women especially in dry-season. • Will help in the empowerment of women.
Implementation of environmental mitigation measures during road construction	• Gradually develop in-house capacity for environmental assessments, implementation, and monitoring to ensure sustainability of the interventions	• Continue with the project based approach	• It is necessary to address the issue in a comprehensive way rather than a project based approach
Road safety	• Proactively pursue road safety related issues and support other stakeholders to reduce traffic accidents on rural roads.	• Do-nothing; leaving the road safety issues for other stakeholders to address.	• Road accidents are a major concern for RGC. • Cost of road traffic accidents is estimated at three percent of the GDP. • Productive age population is disproportionately affected by traffic accidents.

Issues	Chosen Option	Other options considered	Reasons for the choice
HIV/AIDS	• Taking feasible steps to reduce the risks of the spread of HIV/AIDS infections from road construction related activities and supporting national HIV/AIDS awareness campaigns	• Do nothing	• HIV/AIDS is a major threat to Cambodia's development • One of the CMDGs (CMDG 6) is connected to HIV/AIDS. • The spill-over of HIV/AIDS into rural areas is now a major concern.
Stakeholder participation	• Taking steps to comprehensively address stakeholder participation issues at all stages of the project cycle.	• Addressing stakeholder participation issues on a project by project basis	• Comprehensive stakeholder participation is fundamental in making rural road interventions effective and sustainable • Without comprehensively addressing stakeholder participation issues, the rural road projects will not be able to address the needs of the poor and disadvantaged groups effectively.
Financing			
Rate of improvement of rural road network	• Rate of improvement - All T, ST1, ST2 and ST3 roads are improved by 7, 10, 15 20 years respectively • Only spot improvement for ST3 roads	• Rate of improvement - All T roads are improved within 7 years and ST1, ST2 and ST3 roads are improved by 10 years. • Rate of improvement - All T roads are improved by 7 years, all ST1 & ST2 roads by 10 years and ST3 roads 15 years	• The selected option seems to be the most realistic option considering the current level of funding available; • The selected option will be most suitable considering the institutional capacity at MRD and Commune Councils.
Sustainability			
Development of sustainable maintenance management system	• Implementation of a basic maintenance system and gradual progression towards a more sophisticated system.	• Do-nothing • Development of a comprehensive and sophisticated system under which decision-making will be supported by a GIS spatial and attribute database covering the whole contry	• Under the selected option there will be a gradual adaptation of a more sophisticated system. • The selected option appears more sustainable. • The selected option will make use of the existing institutional experience and knowledge.
Overloading control	• Appropriate interventions to control overloading on roads	• Do nothing	• Will minimise damage to rural roads & appurtenant structures; • Will reduce maintenance and

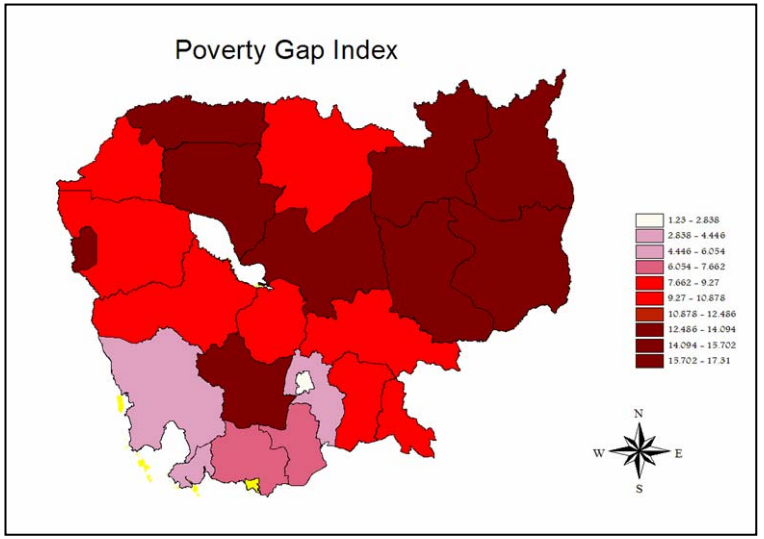
Issues	Chosen Option	Other options considered	Reasons for the choice
			investment costs.
Involvement of private sector in development and maintenance of roads	• Gradual phasing out of the involvement of the public sector in rural road related roadworks with the gradual development of private sector capacity.	• Immediate out-sourcing of all construction and maintenance of roadworks to private contractors, thereby prohibiting the direct involvement of public sector in rural road construction and maintenance activities	• The selected option will be more sustainable in the longer term. • There is a requirement to develop private sector capacity to take over responsibilities from public sector.
Application of labour-based technology in roadworks	• Proactive interventions including positive discriminations in favour of LBAT.	• No proactive interventions; i.e. leaving the choice of technology to market forces	• Greater financial and economic beneftits. • More employment generation potential • More poverty reduction potential.
Surfacing of rural roads	• Progressive replacement of gravel as the main surfacing option following the trials of other surfacing options, and conclusions on the best options for different traffic, physical and climatic conditions	• Continue the use of gravel as the main surfacing material	• Will reduce resource wastage. • Will help in sustainable development and maintenance of rural roads.
Monitoring and evaluation	• Adoption and implementation of a uniform results-based M&E system and undertaking a number of appropriate actions to help implement the system	• Adoption and implementation of a process monitoring system	• M&E is very important for the long term sustainability of rural road interventions • A well designed results-based M&E system provides important feedback on what works, what does not work and why not.
Institutional			
Institutional strengthening	• Take steps to strengthen capacities for managing roads under the responsibility of CCs immediately, and strengthen the capacities of the provincial and district offices when the rural road management related roles and responsibilities of the provinces and districts have become clearer during the implementation of the D&D strategy	• Do-nothing	• Communes shoulder a lot of responsibilities in development, maintenance and management of rural roads. Therefore it is necessary to increase their capacities. • Given that the current organisational structure of provinces/districts are weak, there is a need to improve their capacities as well.

Issues	Chosen Option	Other options considered	Reasons for the choice
Staff development	• Take steps to assess the human resource development needs at different levels – from MRD headquarters to communes – and devise a strategy to fulfil the needs with appropriate training arrangements. Analysis of training gaps from time to time will also be a part of the strategy.	• Do-nothing	• It is necessary to improve the management capacities at different levels – from MRD Headquarters to Communes.
Communication and coordination	• Seek to facilitate more effective communication and coordination within MRD, between MRD headquarters and its field offices, between MRD and CCs, between MRD and other ministries and between MRD and donors.	• Do-nothing	• Effective communication and coordination is necessary to reduce duplication of efforts, encourage efficient use of scarce resources and for cross-fertilisation between projects

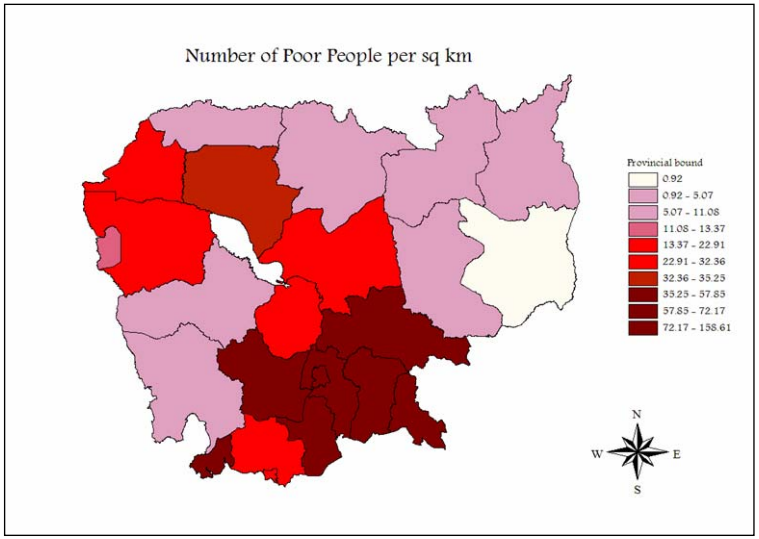
APPENDIX VI: SPATIAL ANALYSIS RESULTS



Headcount Index (% of population below poverty line)

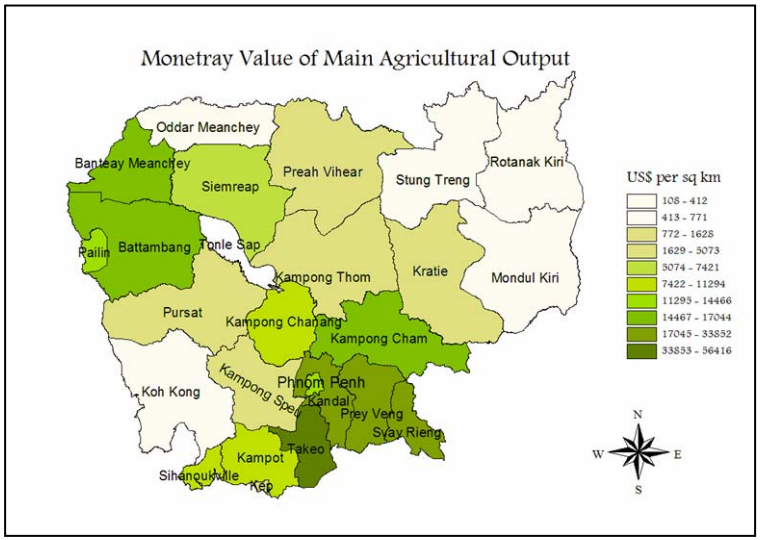


Poverty Gap index

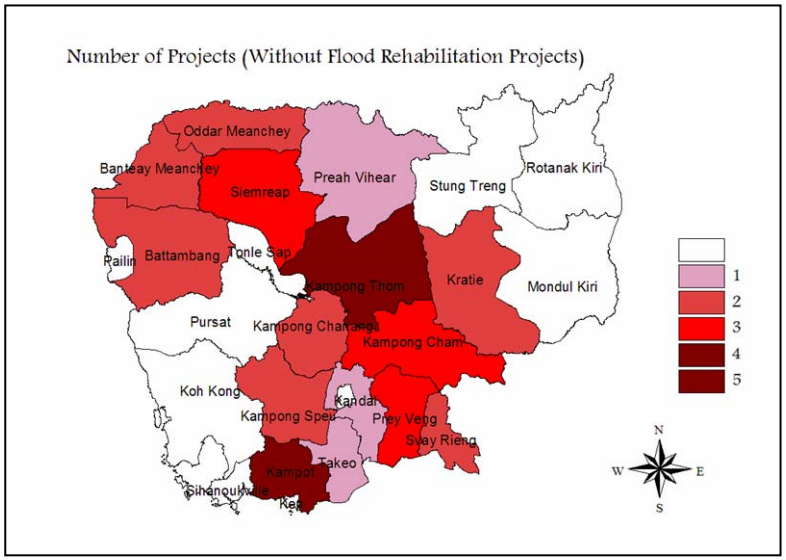


Number of poor people per sq km area

Poverty Gap Index



Monetary value of main agricultural products per unit area



Project intervention (No. of projects)

APPENDIX VII: POVERTY ESTIMATE BY GEOGRAPHICAL ZONE AND PROVINCES

Province	Poverty Headcount	Poverty Gap Index	Poverty Severity Index	Comments
Plain	**32.50**	**7.62**	**2.65**	
Kampong Cham	37.04	9.28	3.34	
Kandal	22.24	4.81	1.68	
Preah Vihear	37.20	8.09	2.65	
Svay Rieng	35.93	8.35	2.75	
Takeo	27.71	6.31	2.09	
Tonle Sap	**42.66**	**12.09**	**4.74**	
Banteay Meanchey	37.15	9.82	3.58	
Battambang	33.69	7.94	2.65	
Kampong Thom	52.40	15.55	6.23	
Siemreap	51.84	17.31	7.46	
Kampong Chanang	39.57	10.35	3.78	No disaggregated information available
Pursat	39.57	10.35	3.78	
Coast	**28.80**	**6.11**	**2.02**	
Kampot	29.96	6.60	2.30	
Kep	23.18	4.60	1.38	No disaggregated information available
Koh Kong	23.18	4.60	1.38	
Sihanoukville	23.18	4.60	1.38	
Plateau/mountain	**51.78**	**15.47**	**6.22**	
Kampong Speu	57.22	16.98	6.72	
Other plateau/mountain	**46.11**	**13.20**	**4.98**	
Kratie*	46.11	13.20	4.98	No disaggregated information available
Mondul Kiri *	46.11	13.20	4.98	
Prey Veng *	46.11	13.20	4.98	
Rotanak Kiri *	46.11	13.20	4.98	
Stung Treng*	46.11	13.20	4.98	
Oddar Meanchey*	46.11	13.20	4.98	
Pailin*	46.11	13.20	4.98	
Phnom Penh	**4.6**	**1.23**	**0.49**	
Cambodia	**35.13**	**9.19**	**3.45**	

Source: Knowles, 2005

APPENDIX VIII: RANKING OF PROVINCES BY POVERTY, AGRICULTURAL PRODUCTION AND COMPLETED PROJECTS

Province	Population	No of poor people per sq km	Value of main agriculture produce per sq km ($) [1]	Number of present plus previous projects [2]	Method A - Weights with poverty bias [3]: Score	Method B - Equal weights [4]: Score	Rank	
							A	B
Phnom Penh	999,804	159	14,162	2	0.101	0.081	1	1
Takeo	793,129	62	56,416	3	0.08	0.081	2	2
Kandal	1,075,125	67	25,239	3	0.064	0.059	3	3
Prey Veng	946,042	72	33,852	5	0.061	0.055	4	4
Svay Rieng	478,252	58	26,712	4	0.056	0.052	5	6
Sihanoukville	155,690	41	10,594	1	0.053	0.054	6	5
Kampong Cham	1,608,914	61	17,044	5	0.046	0.04	7	11
Kep	28,660	20	5,073	0	0.045	0.05	8	7
Pailin	22,906	13	14,466	1	0.043	0.049	9	8
Banteay Meanchey	577,772	32	16,690	4	0.038	0.038	10	12
Kampong Speu	696,164	49	3,504	4	0.037	0.033	11	16
Stung Treng	81,074	3	771	0	0.036	0.042	12	9
Battambang	793,129	23	16,172	4	0.034	0.035	13	15
Kampong Chanang	417,693	30	10,531	4	0.034	0.033	13	16
Mondul Kiri	32,407	1	108	0	0.034	0.041	13	10
Preah Vihear	119,261	4	1,139	1	0.031	0.037	14	13
Pursat	360,445	11	3,648	2	0.031	0.035	14	15
Rotanak Kiri	94,243	4	757	1	0.031	0.037	15	13
Koh Kong	132,106	3	412	1	0.03	0.036	16	14
Siemreap	790,168	35	7,421	5	0.029	0.026	17	18
Oddar Meanchey	68,279	5	667	2	0.027	0.031	18	17
Kampot	528,405	32	11,294	6	0.025	0.022	19	19
Kratie	263,175	11	1,628	4	0.02	0.022	20	20
Kampong Thom	569,060	21	3,822	7	0.011	0.008	21	21

Notes:
[1] The main produce considered were; rice, maize and cassava;
[2] Excludes some minor projects including WFP food-assisted projects;
[3] Weights – Poverty 0.5; Agricultural potential 0.25; Number of rural road projects implemented 0.25;
[4] Weights – Poverty 0.33; Agricultural potential 0.33; Number of rural road projects implemented 0.33

APPENDIX IX: SUMMARY ANALYSIS OF THE SUITABILITY OF DIFFERENT METHODS FOR RANKING RURAL ROADS

Available methods	Traffic Data	Cost Data	Population data	Availability of social services	Level of Community Participation	Complexity	Comments
HDM – 4	Yes	Yes	No	No	Non- existent	**Most complex** 	Requires considerable data. Model needs calibration. Suggested to be suitable for higher volume roads (>200 vehicles per day). May be suitable for strategic analysis of the network. Requires high degree of technical proficiency to operate.
RPM	Yes	Yes	Yes	Yes	High		Used in Ghana for feeder road prioritisation. Simple spreadsheet model to implement. Requires considerable data. One of its strengths is user participation in the decision making process. Has a "benefit-cost ratio" threshold level of 0.2 that has been set arbitrarily. Some assumptions in the model are found to be inaccurate. Implementation requires considerable resources – both human and cash.
Roads Economic Decision Model (RED)	Yes	Yes	No	No	Non-existent		Simple spreadsheet model available freely on the internet. Easy to operate. Suggested to be suitable for traffic level between 50 and 200 VPD and also for unpaved roads. Vehicle operating cost relationships need calibration. With improved understanding of the travel time saving values in developing countries from recent studies, the model is an obvious choice for prioritising roads that have moderate VPD.
CREAM Model	No	Yes	Yes	No	Minimum		Developed for the ADB assisted Rural Infrastructure Improvement Project (RIIP) in Cambodia – uses a consumer surplus criterion

Available methods	Traffic Data	Cost Data	Population data	Availability of social services	Level of Community Participation	Complexity	Comments
							and trip generation gravity model. To operate the model in its simplest form it requires three types of information: population density of the area of influence of the road; length of the road (does not have any effect on the results); and estimated construction costs per km. Requires calibration for the Vehicle Operating costs, vehicle occupancy etc. Based on some simplified assumptions.
Multi-criteria Analysis (MCA)	Yes/No (depending on the criteria considered)	Yes		Yes/No	Medium to High		In many cases MCA is used to rank rural roads. Criteria are selected based on their relative importance (criteria such as traffic level, proximity to social and economic facilities are common). However, often weights against the criteria are given subjectively. There are procedures available to identify the criteria and to scientifically calculate the weights based on the overall objective of the intervention. A recent development in this area is the publication of Overseas Road Note 22 by Transport Research Laboratory, UK. The associated software can be obtained free of charge. MCA has the potential to become a leading method to rank rural roads.
Modified Cost-effectiveness Approach	No	Yes	Yes	No	Non-existent		Proposed for feeder road priortisation I Ghana under a DFID funded project. Although the cost-effectiveness approach (CEA) is easy to use, it does not take into consideration the physical conditions of the roads in question. There is always a possibility that fair condition roads would get preference over poor condition roads if the CEA is used in its proposed form.

Available methods	Traffic Data	Cost Data	Population data	Availability of social services	Level of Community Participation	Complexity	Comments
							Often it is suggested that trafficability or passability factors should be included within the CEA.
Cost-effectiveness approach (CEA)	No	Yes	Yes	No	Non-existent	↓ **Most straight forward**	Suggested to be suitable for improvement to "basic access standard." The roads are ranked on the basis of the cost-effectiveness indicator: cost of improving a link to "basic access standard" divided by the number of people served by the link. Most suitable for ranking of low-volume roads that are expected to be improved to provide "basic access" to the communities living along the road corridors.

APPENDIX X: PROPOSED INTERIM DESIGN STANDARDS OF TERTIARY/SUB-TERTIARY RURAL ROADS

Item	Designation	Type A	Type B	Notes
1	Composition of traffic (ADT)	201 ~ 2,000+	0 ~ 200	Design Period Max flow in PCU
2	Design Period	15 years	10 years	
3	Design speed (km/hr)	70 / 60 / 50	60 / 50 / 40	Flat / Rolling / Mountainous
4	Assumed ESA of commercial vehicle (6 tyres or more)	1.0	0.4	If axle load surveys are not possible
5	Minimum radius of curvature (metres) Unpaved surface	190 / 125 / 80	125 / 80 / 40	Flat / Rolling / Mountainous
6	Minimum radius of curvature (metres) Paved surface	130 / 85 / 60	85 / 60 / 30	Flat / Rolling / Mountainous
7	Vertical alignment maximum (%) Earth Road	4%	6%	Steeper gradients should be spotimproved
8	Vertical alignment maximum (%) Gravel Road	6%	6%	4% if rainfall 1,000–2,000mm/year. Gravel unsuitable > 2,000mm/year
9	Vertical alignment maximum (%) Paved Road	15%	20%	Maximum 10% for thin bitumen seals
10	Horizontal sight distance (metres) Flat / Rolling / Mountainous	85 / 65 / 50	65 / 50 / 35	
11	Maximum super elevation (%)	7%	7%	Normally 3 – 4% is appropriate
12	Extra widening / Increased width at curves (metres)	0.5m	0.5m	If radius of curvature <100m
13	Constructed Carriageway Camber / Cross fall (%): Unpaved / Paved	7% / 3%	7% / 3%	Concrete Slab may be 2%
14	Shoulder plus Verge Width each side of carriageway (minimum)	1.0 metre	1.0 metres	Can be reduced in mountainous areas with provision of passing bays on single lane roads. Minimum Type B roadway = 6.0m
15	Width of earth/gravel/laterite/paved surface carriageway (minimum)	5.0 metres	3.5 metres	These are minima. If resources allow, wider carriageway may be justified
16	Initial constructed thickness of laterite / gravel surface (mm)	200mm compacted	150 ~ 200 mm compacted	Use technical design guidelines, gravel may not be suitable
17	Paved road pavement thickness	depends onrequirements	depends on requirements	Use technical design guidelines
18	Elevation of road formation	500 mm above	500 mm	Sub-grade formation level

Item	Designation	Type A	Type B	Notes
	(minimum)	the HFWL	above the HFWL	
19	Embankment construction Maximum layer thickness (compacted)	150mm (each) horizontal layer	150mm (each) horizontal layer	Depends on compaction equipment used. All earthworks must be compacted
20	Embankment side slope	1:2 ~ 1:3	1:2 ~ 1:3	(vertical:horizontal)Turfed finishing
21	Side drainage ditches See technical guidelines	See technical guidelines	See technical guidelines	Trapezoidal shape, Turfed. Scour checks or lined if gradient >4%
22	Right of way (from Road Centre line to each Side) (metres)	15	15	Recommended
23	Unobstructed clearance between backs of culvert headwalls at road surface level (Minimum)	7.0 metres	6.0 metres	Headwalls extending above embankment finished level should be clearly marked
24	Unobstructed carriageway width at single lane drifts and structures with width restriction and warning signs (Minimum)	3.5 metres	3.0 metres	Suitable barriers and warning signing to be provided
25	Berm width at embankment toe	2.0 metre	2.0 metre	Recommended minimum

Note: Unpaved = Earth or Gravel/laterite

APPENDIX XI: ALLOCATION OF C/S FUNDS (2002-2005), MILLION RIELS

	Administration	Development	Total
In nominal terms			
2002	530	2,664	3,194
2003	15,769	32,031	47,800
2004	19,333	38,667	58,000
2005	20,712	45,388	66,100
In real terms			
2002	575	2,889	3,464
2003	16,570	33,657	50,227
2004	20,070	40,140	60,210
2005	20,712	45,388	66,100

Compound rate of increase between 2003-2005 (in real terms): **15%**

Source: Seila Website:

APPENDIX XII: ASSESSMENT OF IMPROVEMENT/MAINTENANCE COSTS - MAIN ASSUMPTIONS

Time Frame & Unit Costs

	Scenario 1	Scenario 2	Scenario 3
Network Improvement Rate			
Bring all T roads to maintainable standard (yrs)	7	7	7
Bring all ST1 roads to maintainable standard (yrs)	10	10	10
Bring all ST2 roads to maintainable standard (yrs)	10	10	15
Bring all ST3 roads to maintainable standard (yrs)	10	15	20
Unit cost of Rehabilitation (US$ per km) [a]			
T (alternative surface)	25,000	25,000	25,000
T (gravel)	20,000	20,000	20,000
ST1	16,000	16,000	16,000
ST2	12,000	12,000	12,000
ST3	10,000	6,000	6,000
Unit cost of Periodic Maintenance (US$ per km) [a]			
T	6,000	6,000	6,000
ST1	4,500	4,500	4,500
ST2	3,000	3,000	3,000
ST3	2,500	2,500	2,500
Unit cost of Routine Maintenance (US$ per km) [a]			
T	700	700	700
ST1	500	500	500
ST2 & ST3	200	200	200
Unit cost of bridge/culvert construction (per m)	750	750	750
Bridge/culvert requirements (m/km)	2.3	2.3	2.3

Notes: [a] Cost estimates are mainly based on RIIP analysis results of TRIP III roadwork unit costs. They have been factored up.

Other important assumptions

- The rural road network is estimated at approximately 28,000 kms. The following estimated lengths have been factored up by 16.5% to take into consideration the roads that have been omitted by the provinces.

Type	Total km	Laterite km	Earth km	All Weather km	Dry Weather km
T	1,972	1,373	599	729	1,243
ST1	2,651	1,682	968	659	1,992
ST2	3,949	2,460	1,489	689	3,261
ST3	15,456	3,937	11,520	1,859	13,597
Total	24,028	9,452	14,576	3,936	20,092

- While MRD/PDRD will be responsible for T & ST1 roads, Commune Councils will be responsible for ST2 & ST3 roads.
- Only spot improvement of ST3 roads under Scenario 2 and 3
- Periodic maintenance of gravel roads: every 3 years
- Periodic maintenance of alternative surfaced roads: every 5 years

APPENDIX XIII: PER YEAR ESTIMATES OF POTENTIAL IMPROVEMENT/MAINTENANCE COSTS

Potential development/improvement funding requirements under different scenarios (million US$)

	Scenario 1	Scenario 2	Scenario 3
2007	32.9	22.5	18.7
2008	32.9	22.5	18.7
2009	32.9	22.5	18.7
2010	32.9	22.5	18.7
2011	32.9	22.5	18.7
2012	32.9	22.5	18.7
2013	32.9	22.5	18.7
2014	27.9	17.5	13.7
2015	27.9	17.5	13.7
2016	27.9	17.5	13.7
Total (20007-16)	313.7.4	209.6	171.9
Average	31.4	21.0	17.2

Notes: In 2006 prices

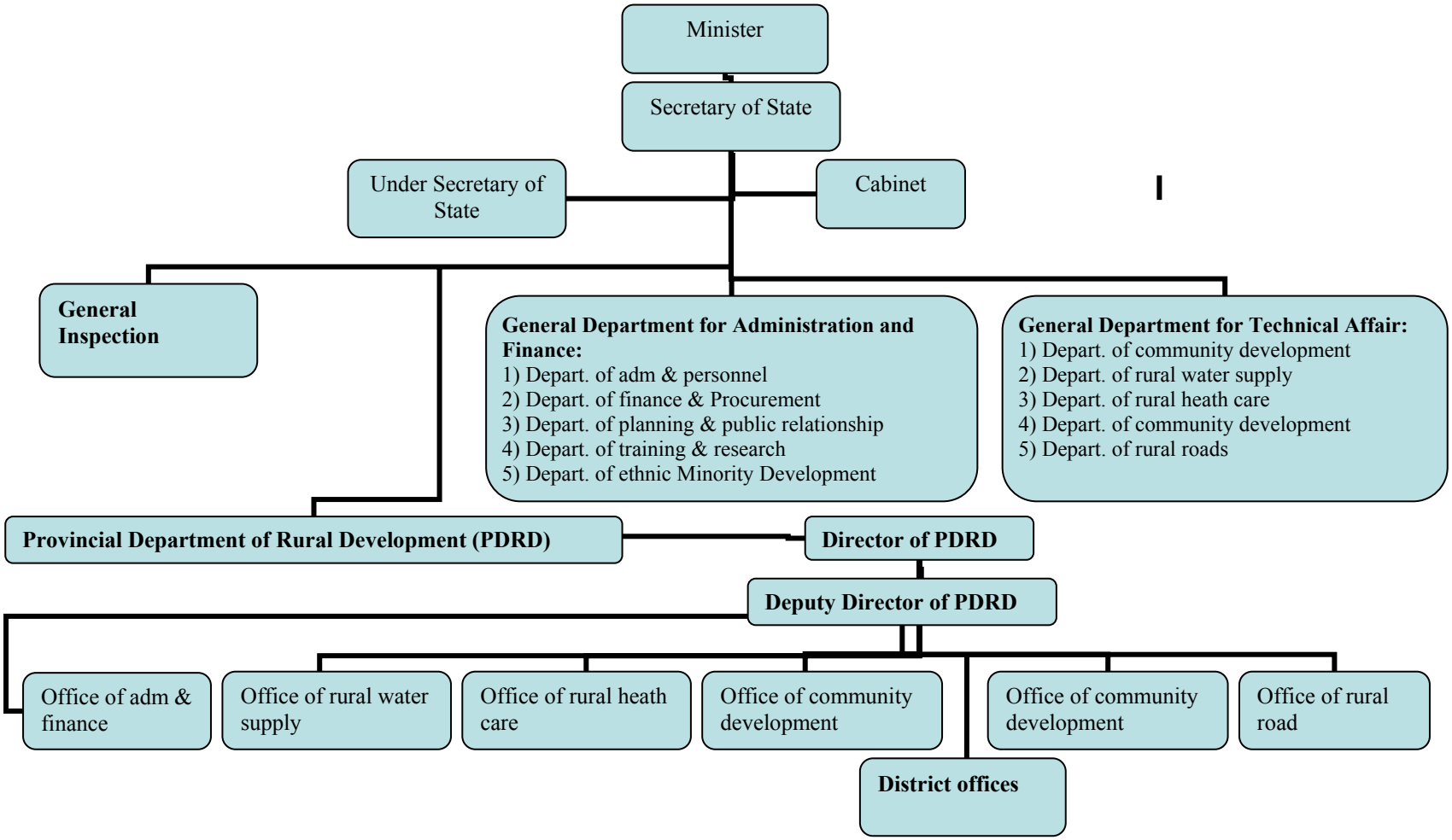
Potential maintenance funding requirements under different scenarios (million US$)

		Scenario 1	**Scenario 2**	**Scenario 3**
2007	Periodic	5.5	5.5	5.5
	Routine	1.1	1.1	1.1
	Total	6.6	6.6	6.6
2008	Periodic	5.5	5.5	5.5
	Routine	1.7	1.7	1.6
		7.2	7.2	7.1
2009	Periodic	5.5	5.4	5.5
	Routine	2.4	2.2	2.0
		7.9	7.6	7.5
2010	Periodic	12.2	10.9	9.9
	Routine	2.6	2.3	2.1
		14.8	13.2	12.0
2011	Periodic	12.2	10.9	9.9
	Routine	3.2	2.9	2.6
		15.4	13.8	12.5
2012	Periodic	12.9	11.5	10.5
	Routine	3.8	3.4	3.1
		16.7	14.9	13.6
2013	Periodic	19.7	17.0	14.9
	Routine	3.9	3.5	3.2
		23.6	20.5	18.1
2014	Periodic	19.6	17.0	14.9
	Routine	4.5	4.0	3.6
		24.1	21.0	18.5
2015	Periodic	19.6	17.0	14.9
	Routine	4.9	4.2	3.8
		24.5	21.2	18.7

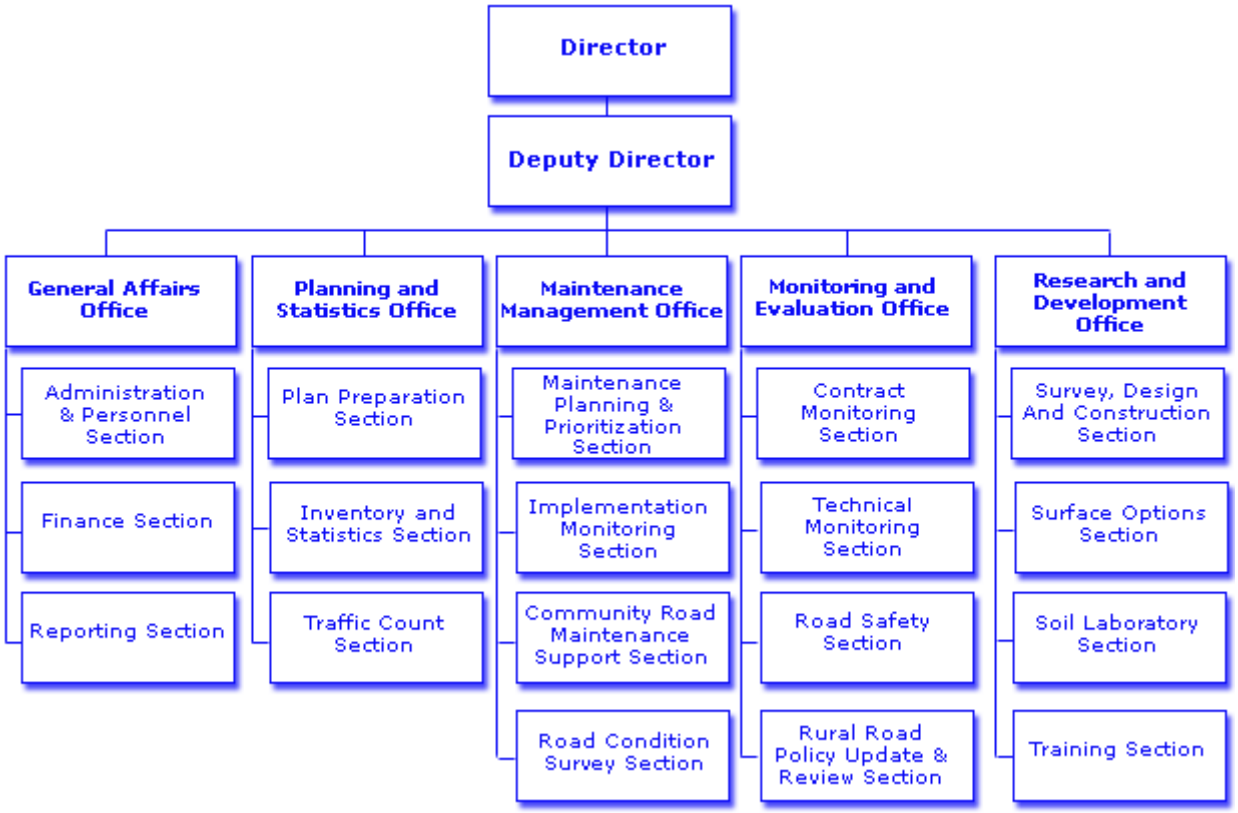
		Scenario 1	Scenario 2	Scenario 3
2016	Periodic Routine 	26.4 4.7 31.1	22.4 4.1 26.5	19.3 3.7 23.0
Overall (2007-2016)	Periodic Routine 	138.9 32.9 171.8	123.0 29.4 152.4	110.6 26.8 137.4
Average	Periodic Routine Total	13.9 3.3 17.2	12.3 2.9 15.2	11.1 2.7 13.7

Note: all in 2006 prices

APPENDIX XIV: MRD ORGANOGRAM



Organisational Structure of MRD Department of Rural Roads



APPENDIX XV: EDUCATIONAL LEVELS OF DRR STAFF & OTHER PROJECT/PROGRAMME STAFF

Staff educational level at DRR (as of January 2006)

	Number
Staff with a postgraduate level degree	
Civil Engineering	3
Financial management and banking	1
Business and administrative	2
Sub-total	**6**
Staff with a graduate level degree	
Civil engineering	4
Hydraulic engineering	14
Economics	7
Architecture	4
Mechanical engineering	2
Other	1
Sub-total	**32**
Staff with an undergraduate degree	
Civil works	5
Baccalaureate	5
Sub-total	**10**
Grand-Total:	**48**

DRR staff working in other projects/programmes

	Number
North-Western Rural Development Project (NRDP)	8
Tertiary Road Improvement Programme (TRIP)	4
Provincial Rural Infrastructure Project (PRIP)	3
Council for Development of Cambodia (CDC)	1
Seila/ NCDD	1
Steung Chinet	1
Total	**18**