. MASTER PLAN

CHAPTER 1 CONCEPT FOR ESTABLISHMENT OF MASTER PLAN

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1.1 Introduction

The objective of establishing a Master Plan is to prioritize projects and to develop an implementation program up to 2020 to enable all roads and bridges in the study area to be passable all year round and to be capable of handling the expected increase in traffic.

The highest priority projects have been selected for possible implementation by 2007

1.2 Selection Process and Priorities

The southern part of the country (i.e. Champasack, Attapeu, Sekong, Saravan and Savannakhet) is expected to **serve as a bridge to integrate neighboring ASEAN countries** to stimulate economic growth. The poor condition of the transport network in the region **hinders poverty reduction efforts and stifles economic growth**.

The study focuses on the following aspects.

Basis Access providing reliable all-weather access for people living in isolated areas, to reduce poverty,

The role of international / regional corridor, providing new and important road links

The selection process and priority-setting applied for the Study, consists of the following two steps:

(1) Screening:

Reduce the number of investment alternatives given budgetary constraints.

- (a) targeting disadvantaged areas based on a variety of factors, including traffic level, environmental impacts, technical feasibility, and financial and economic viability.
- (b) eliminating investments into low-priority projects of the network selected based on agreed criteria and projects which have already been committed for implementation.

(2) Ranking:

After screening methods have been applied to a given set of investment choices, resources are still unlikely to be sufficient to finance the balance of the remaining desirable interventions, and hence a ranking or prioritization exercise is required.

The following three main ranking and/or prioritization methods are widely applied and the Study team has reviewed and examined the applicable method for the Study.

(a) Multi-Criteria Analysis

Multi-criteria analysis (MCA) can incorporate not only cost + benefit + impact, but socioeconomic impacts and environmental impacts into ranking system. Criteria such as traffic level, proximity to health and education facilities and agriculture assets are given weights (points), relative to their perceived importance.

(b) Cost-Effectiveness Analysis

Cost-effectiveness analysis (CEA) also is used to rank investment programs. It compares the cost of interventions with their intended impacts.

(c) Cost-Benefit Analysis

Cost-Benefit Analysis (CBA) is a comprehensive accounting of all real costs and benefits associated with a project. In the case of road projects, this includes users and non-users, as well as road agency costs. Where the impact on non-users is negligible, a CBA of road alternatives centers around the trade-offs between total life-cycle costs of infrastructure (i.e., capital and maintenance) and user costs and benefits (e.g., vehicle operating cost and time savings). The CBA ranks alternative interventions based on the net present value (NPV), Economic Internal Rate of Return (EIRR), Benefit Cost Ratio (B/C) or First Year Benefit (FYB). The results are independent of the size of the initial investment, and can be utilized in selecting projects when taking into account regional equity.

Consumer surplus models are well established and applied, such as the Highway Development and Management Model (HDM). Basically, the methods are reliable to apply to higher-volume roads (>300VPD). Its application to low-volume road in some cases encounter problems related to the small magnitude of user benefits and the stronger influence of environment rather than traffic on infrastructure deterioration. With low traffic level, a modified and customized approach can be taken. The recently developed Roads Economic Decision Model (RED) of the World Bank is one example. Traffic on such very low volume consists of majority of non-four-wheeled vehicles. The application of HDM and RED shall require calibration process to reflect local conditions.

The Study team **concludes** to that **the MCA approach**, which integrates economic evaluation of road investments using conventional CBA, with its enhancements criteria on **socioeconomic impacts**, **environmental impacts**, etc. is appropriate.

The above concept to be applied for the Study is illustrated in the following chart.

Step 1 (Screening)



Step 2 (Ranking)



Figure 1.2.1 Selection Process and Priority Setting Method

1.3 Road Links to be Improved

The road improvement projects have been selected from among national road links in the southern region that are not passable for 12 months, excluding links which have already been committed for implementation i.e., Route No.15 (Junction at Ban Phone Dou – Vietnam Border), Route No.16 (Lamarm – Vietnam Border) and Route No.18B in the study area.

The selected roads comprise 16 routes or links of 879.5 km total length out of the 2025.1 km of national roads in the study area. The present road conditions and characteristics of these roads are summarized in Tables 1.3.1 and 1.3.2.

Route	Origin	Destination	Length	Summary of Road Conditions
	C		(km)	· ·
1G	ICT of Rt 9	ICT of Rt 15	130.0	Including 32 km missing link. Bad
10	JC 1. 01 Kt. J	JC 1. 01 Kt. 15	130.0	conditions through the whole section
1H	JCT. of Rt. 20	JCT. of Rt. 16	22.5	Improved road with a gravel surface
1J	JCT. of Rt. 18B	Border of Cambodia	81.0	Including 65 km missing link
14A(i)	Phong Thoth Dist.	Ban Sam Kha	54.0	Including 25 km missing link
14A(ii)	Ban Sam Kha	JCT. of Rt. 14C	51.5	Vehicles can pass for only 2 months at Houay Kamouan River.
14A(iii)	M. Moonlapamok	Border of Cambodia	32.0	Many rivers cross the route.
14A1	Ban Ang Kham	Ban Don Talath	32.0	Fair condition through the route.
14B	JCT. of Rt.16	Border of Cambodia	149.0	The first 11.2 km of the road has been
				The read has been improved with gravel
14C	Ban Nong Nga	M. Moonlapamok	42.0	surface at some sections.
14C1	Ban Hieng	Ban Sam Kha	23.0	The road has been improved with gravel
	2 an mong			surface at some sections.
14C2	Ban Phone Photh	Ban Nong Te	6.0	Improved road with gravel surface.
15	JCT. of Rt. 13S	JCT. of Rt. 1H	73.0	Improved road with gravel surface.
164	ICT of Rt 16	ICT of Rt 11	71.0	The road passes through the mountainous
10/4	JC1. 01 Kt. 10	JC 1. 01 Kt. 11	/1.0	area.
18A(i)	JCT. of Rt. 13S	Border of Province	30.6	Fair condition through the route
18A(jj)	Border of Province	Ve Piene River	30.7	Two big rivers cross the route. Bad
107(11)	Doraci of Floville		59.1	conditions through the whole section
18A(iii)	Xe Piane River	JCT. of Rt. 18B	42.2	Fair condition through the route

 Table 1.3.1
 Candidate Roads for Improvement

	Table 1.5.2 Koad Conditions by Route (1/10)							
Route	1 G				Road	L =	130.0 km	
				Ι	Length			
Origin	Junction of	Route 9		De	stination	Jun	ction of Rou	ute 15
Surface Typ	Surface Type :							
Paved road	1.1 km,	Gravel road	33.1 l	кm,	Earth roa	ad	63.8 km,	Missing link
32.0 km								

 Table 1.3.2
 Road Conditions by Route (1/16)

Terrain Conditions :

This road is mainly located in the flat terrain. Whereas the road in Savannakhet Province mainly passes in a paddy field or forest area, the road in Saravan Province passes in a copse or rice field area. There are some small villages along the route.

Road Conditions :

The total 32 km missing link is located at a section between KM post 35 km and 67 km.

The surface of the road between Junction of Route 9 and KM post 35 km in Savannakhet Province is relatively good condition with 5.0 m to 6.0 m in width. However, the section between KM post 92 km and 130 km in Saravan Province has narrow width of 2.8 m to 4.0 m, and the surface condition is fair. In addition, the section between KM post 67 km and 92 km is in the bad condition with 2.1 m to 3.0m in width. Accordingly, the running speed in this section indicates only approximately less than 10km/hr.

Crossing Condition:

The total 42 rivers cross the road including Xe Bang Hieng and Xe Don with around 200m in river width. However, 16 crossing points including 2 large-scale rivers have no bridge. Therefore, those become a bottleneck and vehicles cannot pass in a rainy season. The major existing bridge type is a timber type.

Socio-economic Conditions:

This area has little economic potential and significant need for social development. Population in 5km range along this route is 250 persons/km. North and central part of this rink runs in Phine district (Savannakhet Province). Phine District has small economic potential with small GDP/capita, little work force in industry and service sector, along Route 1G. Social aspects in Phine district should be greatly improved. Rice production and education need intensive improvement. Accessibility can be gotten better with construction of missing link. The southern part of the Route 1G runs in Toomlarn district and Saravan District (Saravan Province). These two districts have a large population along Route 1G. Toomlarn District, which has large ethnic minority population, attains just 23.9% in literacy rate.

Table 1.5.2 Koad Conditions by Koute (2/10)						
Route	1 H	Road	L = 22.5 km			
		Length				
Origin	Junction of Route 20	Destination	Junction of Route 16			
Surface Typ	be:					
Paved roa	d 1.9 km					
Gravel roa	ad 20.6 km					
Terrain Con	nditions :					
This road ru	ns in the flat (7.4 km) and rolling	(15.1 km) terra	ain. Mainly, the road passes in			
the paddy fie	eld area, and there are some small	villages along	the road.			
Road Condi	itions :					
The surface	of the road keeps almost good	condition wit	th 4.6 m to 7.0 m in width.			
Therefore, th	ne running speed in the section res	ulted in approx	. more than 50km/hr.			
Particularly,	the section from Junction of Rout	te 20 to KM po	ost 7.4 km, has just completed			
the grading v	with 5.5 m width.					
Crossing Co	ondition:					
No bridge in	this section					
Socio-econo	omic Conditions:					
This 25km	long link runs in Thateng Distri	ict (Sekong Pr	rovince) and Saravan District			
(Saravan Pro	(Saravan Province). These two districts are rather rich with enough rice production/person					
and coffee production. Population along the road counts 6,348 persons, and 84.7% of them						
are ethnic n	are ethnic minorities. Literacy rate is 39.8% for Thateng and 53.2% for Saravan. Since					
Route1H is	Route1H is already in a fair condition, significant upgrading of area accessibility is not					
expected by	the improvement of this link.					
ource: Study Team						

Table 1.3.2Road Conditions by Route (2/16)

Route	1 J	Road	L = 81.0 km		
		Length			
Origin	Junction of Route 18B	Destination	Border of Cambodia		
Surface Type :					

Table 1.3.2Road Conditions by Route (3/16)

Gravel road 16.0 km, Missing link 65.0 km

Terrain Conditions :

The first 16 km of the road is located in the flat terrain, with the copse area. In addition, the road passes through some small villages. The section in the rolling or mountainous terrain after KM post 16 km is missing link.

Road Conditions :

The 65 km missing link is located at the section between KM post 16 km and 81 km. The road surface of the first 16 km section keeps fair condition with 3.5 m to 4.2 m in road width. Vehicles can run through this section with the normal speed of approx. 40km/hr because regravelling or grading activities were executed recently in some sections,

Crossing Condition:

There are 8 small to large rivers are located in the first 16km section. On 7 rivers among 8 rivers, the temporary timber bridges exist. However, there is no bridge at Xe Kong river with approx. 200 m width and a ferry, which accommodate 4-5 sedan vehicles, is operating through a year. There is some small rivers except for Nam Kong River in the section after 16km, but with no bridges.

Socio-economic Conditions:

This road starts Samakhixay District (Attapeu Province) and goes down through one of the poorest district in the study area – Phouvong. There is no road in 80% of the link length. Population within 5km is 179 person/km, including Samakhixay part. Vehicle ownership is negligible. In Phouvong district, population of ethnic minorities is dominant. Rice production is 128kg/person, far below the survival level. Literacy rate is 28.1%, one of the worst in the study area. Since accessibility is very outrageous, improvement will greatly affect social development of the area.

Route	14 A (i)	Road	L = 54.0 km	
		Length		
Origin	Phone Thong Dist.	Destination	Ban Sam Kha	
	(JCT. of Route 16)		(Junction of Route 14 C1)	

Table 1.3.2Road Conditions by Route (4/16)

Surface Type :

Paved road 13.8 km, Gravel road 15.2 km, Missing link 25.0 km This link is the beginning section of Route 14A.

Terrain Conditions :

This road runs through the flat terrain with paddy field. There are some small villages along the road, especially some residences concentrates at the beginning of the missing link (25 km) section. In the Champasack town section, there are many houses along the existing road.

Road Conditions :

The 25 km of the missing link is located at the section between JCT of Route 16 and KM post 25 km. The road surface between Km post 25 and Wat-phou (KM post 38.8) is a pave road and keeps very good or good conditions with 5.0 m to 7.9 m in width. The section between KM post 38.8 km and 54.0 km is a gravel road and has the larger width of 9.0 m. The surface condition is fair. The average running speed is approx. more than 50km/hr.

Crossing Conditions:

There are four small to medium scale rivers without bridge, ranging from12 to70m in width in the missing section. In addition, 4 small rivers cross the road with a bailey bridge in the section after missing link

Socio-economic Conditions:

This is the northern part of Route 14A and runs in Phonthong, Champasack, and Sukhuma Districts of Champasack Province. This route goes through rice rich and densely populated area along the Mekong River. These three districts have considerable size of fork force in industrial and service sector. Wat Phou, a ruin of ancient Kumer civilization with World Heritage status, generate more traffic from Thailand into this route. No significant problem is found with the social aspects of this area.

Route	14 A (ii)	Road	L = 51.5 km		
		Length			
Origin	Ban Sam Kha	Destination	Junction of Route 14 C		
	(Junction of Route 14 C1)				

Table 1.3.2Road Conditions by Route (5/16)

Surface Type :

Gravel road 19.1 km, Earth road 32.4 km

This road is second section of Route 14A.

Terrain Conditions :

This road is mainly located in the flat terrain comprising the paddy field or forest area. In addition, the road in the first 19.1 km passes through some residence area. In the section after 19.1 km, there is no residence.

Road Conditions :

The surface of the first 19.1 km section keeps fair condition with 9.0 m in width. Accordingly, the running speed in this section indicated approx. more than 40km/hr.

However, the section after KM post 19.1 km is in the bad condition with an earth surface and 2.5 m in width. The running speed in this section indicated approx. less than 10km/hr.

Crossing Condition:

Although there are 2 small and big rivers on the road, only 1 bridge has been constructed. At Houay Khamuan River, a vehicle can pass for only 2 months in a year. Therefore, this section can be regarded as a missing link.

Socio-economic Conditions:

This route runs in Sukhuma and Moonlapamok District. East side of the districts, where this route serves, is more prosperous than the other part of them. The area produces more than sufficient rice for their population. The area has higher economic potential and smaller need for social development. Since the road condition is in very bad condition, its improvement may contribute to economic development of the area.

	Table 1.3.2 Road Conditions by Route (6/16)						
Route	14 A (iii)	Road	L = 32.0 km				
		Length					
Origin	M. Moonlapamok	Destination	Border of Cambodia				
Surface Typ	be :						
Gravel road	2.5 km, Earth road 29.5 km	1					
This road is	third section of Route 14A.						
Terrain Con	nditions :						
This road n	nainly runs through the flat terr	ain, comprisin	g mainly the paddy field or				
residential a	rea.						
Road Condi	itions :						
The first 2.5	km section is a gravel road and it	ts surface keeps	s a good or fair condition. The				
road width r	anges from 5.0 to 8.7 m. The sect	ion after 2.5 kn	n has an earth surface with 4.0				
m in width	and keeps the fair condition. The	ne average run	ning speed in this section is				
approx. less	than 30km/hr.						
Crossing Co	ondition:						
Although 22	small and large rivers are located	l on the road, o	only 2 temporary bridges were				
constructed.	Therefore, at the crossing points,	vehicles canno	t pass in a rainy season.				
Socio-economic Conditions:							
This route runs in Moonlapamok District of Champasack Province. Population in 5km							
range counts 18,389 persons or 575 persons/km. Total ethnic minorities are 505 persons							
along this ro	ad. This district has around 3,000	work forces in	n industrial and service sector,				
and 63.3% of literacy rate.							

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Route 14 A1 Road Length L = 32.0 km Origin Ban Ang Kham Destination Ban Don Talath Surface Type : Gravel road 32.0 km Ban Don Talath Terrain Conditions : This road mainly runs through a flat terrain, which is mainly consisted of a paddy field and residence area. For a paddy field and residence area. Road Conditions : The road has a gravel surface with fair conditions. The road width of this section ranges from 4.0 to 8.0 m. The average running speed in this section is approx. less than 30km/hr. Crossing Conditions: There are 8 small and large-scale rivers on the road, and the temporary bridges were constructed at all crossing points. Socio-economic Conditions: This road link runs in rice-rich districts; Phonthong and Champasack District of Champasack Province. These two districts have a big workforce (8,789 persons) in industrial and service sector. This link has a population of 38,130 in its 5km range with 1,192 person/km. Wat Phou in Champasack District will generate a significant tourist traffic through this road. Rice production is sufficient enough. Literacy rates of the districts are 80.8% and 73.9% and enough higher than the average of the study area. Population of ethnic minorities is very small. The above figures summarize that Route 14A1 is serves very prosperous area with high economic potential and social condition.		Table 1.5.2 Koau Con	uluons by Kou			
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1,192 person/km. Wat Phou in Champasack District will generate a significant tourist traffic through this road. Rice production is sufficient enough. Literacy rates of the districts are 80.8% and 73.9% and enough higher than the average of the study area. Population of ethnic minorities is very small. The above figures summarize that Route 14A1 is serves very prosperous area with high economic potential and social condition.	industrial an	industrial and service sector. This link has a population of 38,130 in its 5km range with				
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very prosperous area with high economic potential and social condition.	ethnic minor	rities is very small. The above fi	gures summari	ze that Route 14A1 is serves		
	very prosper	ous area with high economic pote	ntial and social	condition.		

 Table 1.3.2
 Road Conditions by Route (7/16)

Route	14 B	Road	L = 149.0 km	
		Length		
Origin	Junction of Route 16	Destination	Border of Cambodia	
Surface Type :				

137.8 km

Table 1.3.2Road Conditions by Route (8/16)

Gravel road 11.2 km, Earth road **Terrain Conditions :**

This road is located in either the flat (142.9 km) or rolling (6.1 km) terrain. The road mainly passes in a paddy field or forest area and there are some small villages along the road.

Road Conditions :

The 11.2 km section between Junction Route 16 and Junction of Route 14A1 has a gravel surface, and it keeps relatively good condition because this section is under improvement with the gravel surface. Therefore, The running speed indicated approx. more than 50km/hr. However, the section between Junction 14A1 and the border of Cambodia are an earth road and their surface are fair or bad conditions. Accordingly, the average running speed in this section is approx. more than 30km/hr.

Crossing Conditions:

Although the road crosses over 30 small and medium rivers, bridges have not constructed at the some crossing points. Especially, at the rivers after KM post 53.8km, there is no bridge at all. Accordingly, vehicles cannot pass at some crossing points in rainy season.

Socio-economic Conditions:

This route runs in four districts of Champasack Province, namely, Phonthong, Champasack, Sukhuma and Moonlapamok Districts. Even though these four districts are rich with sufficient rice production and dense population, there is a distinguished disparity between west part and east part of these districts. Generally speaking, east part (i.e. along Mekong River) of these districts is more prosperous. Total population in 5km range of the road is 12,565 persons and per km population is just 84 persons/km. The Route 14A, that runs east part of the same provinces, has 524 persons/km. However, population of ethnic minorities in 5km range is 4,129 persons, which claims 33% of the total population. This area has smaller economic potential and larger need for social development. Accidents of mine explosion in road construction site have been reported in 2001.

Route	14 C	Road	L = 42.0 km
		Length	
Origin	Ban Nong Nga	Destination	M. Moonlapamok
	(Junction of Route 14 B)		

Table 1.3.2Road Conditions by Route (9/16)

Gavel road 9.4 km, Terrain Conditions :

Earth road

Surface Type :

This road is almost located in the flat terrain. Mainly, the road passes in a paddy field or forest area and some small villages are located along the road

32.6 km

Road Conditions :

Improvement has been undertaken at three sections of the total length 10.2 km. In these sections, the road width is approx. 11.0 m and the surface keeps good or fair conditions. The running speed in these sections indicated approx. more than 40km/hr.

In other sections, the surface is in fair or bad conditions with 3.5 m to 6.7 m. in width Accordingly, the running speed showed approx. more than 30km/hr.

Crossing Conditions:

8 small and big rivers cross the road and temporary bridges were constructed at all crossing points. However, one bridge, Houay Kaddannai Bridge, was broken due to over-loaded vehicle.

Socio-economic Conditions:

This route runs in Moonlapamok District. This road connects richer east part and poorer west side with 42km length. Population in 5km range is 6,194 persons or 147 person/km. Ethnic minorities claim 70% of the population. This infers smaller literacy rate than the district average of 63.3%. West part of this route has little economic potential and larger need for social development, while east part has higher economic potential and smaller need for social development. Improvement of this route may work for mitigating disparity between west and east.

Table 1.3.2 Road Conditions by Route (10/16)					
Route	14 C1	Road	L = 23.0 km		
		Length			
Origin	Ban Hieng	Destination	Ban Sam Kha		
	(Junction of Route 14 B)		(Junction of Route 14 A)		
Surface Typ	pe:				
Earth road	23.0 km				
Terrain Co	nditions :				
This road m	ainly runs through the flat terrain	, which mainly	y comprises a paddy field and		
forest area.	There are some small villages alon	g the road.			
Road Cond	itions :				
Since this ro	bad has been improved by grading	, the road surfa	ace keeps good condition with		
10.5 m to 1	1.5 m. in width There was some	sections with o	ne meter height embankment.		
The running	speed indicated approx. more that	n 40km/hr.			
Crossing Co	onditions:				
2 small and	big rivers are located on the road	d and temporar	y bridges exist at all crossing		
points. There	efore, the whole route is passable	through a year.			
Socio-economic Conditions:					
Route 14C1	runs in Sukhuma District in Cha	mpasack Provi	ince, and has similar situation		
with Route 14C. Population in 5km range is 10,756 persons or 468 person/km. Ethnic					
minorities co	ount 2,504 persons. Concentration	of ethnic mine	orities is rather observed in the		
east part of	the district. Literacy rate for who	le district is 61	.6%. There supposed to be no		
significant s	ocial disparity between east and w	vest.			

Route	14 C2	Road	L = 6.0 km		
		Length			
Origin	Ban Phong Photh	Destination	Ban Nong Te		
	(Junction of Route 14 B)		(Junction of Route 14 A1)		
Surface Typ	pe:				
Earth road	6.0 km				
Terrain Co	nditions :				
This road is	almost located in the flat terrain a	and mainly pas	ses in the paddy field or small		
village.					
Road Cond	itions :				
Since this	road is under improvement by	grading, the s	surface showed good or fair		
conditions, a	and the road width is 14.0 m. In in	nprovement wo	orks, pipe culverts are installed		
at some sma	all waterways. The average running	ng speed in this	s section is approx. more than		
40km/hr.					
Crossing Co	onditions:				
Although th	here is one small river, 25m in	width, on the	road, a bridge has not been		
constructed.	Therefore, vehicles can pass only	for 9 months a	year.		
Socio-economic Conditions:					
This route runs in Champasack District of Champasack Province. The area of this very					
short route has almost the same socio-economic characters of 14A1. This road has 3,765					
persons in it	ts 5km range. Ethnic minorities co	ount just 454 p	ersons. Since the area is away		
from the Mekong and major water resources, rice productions per person may be smaller					

Table 1.3.2Road Conditions by Route (11/16)

than the district average 375kg/person.

Table 1.3.2Road Conditions by Route (12/16)							
Route	15	Road	L = 73.0 km				
		Length					
Origin	Junction of Route 13 S	Destination	Junction of Route I H				
Surface Typ	be :						
Gravel road	73.0 km						
Terrain Cor	nditions :						
This road is	mainly located in the flat terrai	in with mainly	a copse area. The road also				
passes throu	gh some small villages.						
Road Condi	itions :						
The road su	urface in all the sections indicate	d fair conditio	n because the road has been				
improved w	ith the gravel surface. As the ro	ad width range	es from 4.1 m to 6.9 m, it is				
regarded as 2 lane carriageway. The average running speed resulted in approx. more than							
40 km/hr.							
Crossing Co	onditions:						
Although the	ere are the total 19 small and large	e-scale rivers or	n the road, bailey bridges have				
been constru	ucted at 18 crossing points. The	ere is one sub-	nergible bridge with 60m in				
length, cross	ing over Xe Don River. A ferry op	perates at this p	oint in the rainy season.				
Socio-econo	omic Conditions:						
Route 15 ru	ins through rich paddy land in k	Khongxedone,	Vapy and Saravan District of				
Saravan Pro	vince. Population within 5km of	f the road cou	nts 806 person/km. Minority				
population is not small (6,580 person), however, they claim just 11.2% of the total							
population along this route. Since the road link is in a fair condition, there is some work							
force of ind	force of industry and service sector developed along it. Rice production of these three						
districts is enough to feed the population. Literacy rate and student ratio is not so serious in							
comparison with the surrounding counterparts.							
ource: Study Tean	n						

S

Route	16 A	Road	L = 71.0 km					
		Length						
Origin	Junction of Route 16	Destination	Junction of Route 1 I					
Surface Type :								
Gravel road	71.0 km							

Table 1.3.2 Road Conditions by Route (13/16)

Terrain Conditions :

This road runs through either a flat (32.1 km), rolling (17.9 km) or mountainous (21.0 km) terrain mainly covered with copse. There are some small villages along the road.

Road Conditions :

The road surface in the first 40 km section is in the good or fair conditions because improvement with the gravel surface has been executed. The average running speed in this section is more than 40 km/hr. As the road width is 4.7 m to 7.0 m, it is regarded as a 2 lane carriageway.

The section between KM post 40.0 km and 60.7 km is located in the mountainous area, and the surface in the first 2.1 km section has a bad condition. This section has narrow width (2.5 m) and also the horizontal curve is small. In general, the road width in the mountainous section ranges from 3.5 m to 3.9 m.

Crossing Condition:

The total 6 small and medium-small rivers are located on the road, and the permanent bridges were constructed at 5 crossing points and a bailey type is at one river. Therefore, the whole road section is passable through a year.

Socio-economic Conditions:

This road link serves the Boloven Plateau area including Paksong District (Champasack Province) and Saysettha District (Attapeu Province). Population along 5km from the road is 192 person/km. Eastern part of this link is down-slope and has little population along it. Ethnic minorities hold majority of the population and counts 12, 675 persons along the link. Literacy rate of the district is 62.3% and student ratio is 22.5%. Cash crops like coffee are cultivated here rather than rice. Accessibility to the market is already secured with the connection to Thai border through Pakse. Route 16A rather contributes to the connection of Attapeu and Sekong province to the west part of the country. Upon the completion of Route 16 east that runs to the Vietnamese border, Route 16A will contribute to transmit traffic from Vietnam to Pakse and to Thai.

Tuble 1.3.2 Rout Conditions by Route (14,10)								
Route	18 A (i)	Road	L = 30.6 km					
		Length						
Origin	Junction of Route 13 S	Destination	Border of province					
			(Xe Kham Pho river)					

Table 1.3.2Road Conditions by Route (14/16)

Surface Type :

Gravel road 30.6 km

This road is first section of Route 18A.

Terrain Conditions :

This road is located in the flat (19.7 km) or rolling (10.4 km) terrain and the road mainly passes in the copse area. There are some small villages along the road.

Road Conditions :

The road surface keeps a fair condition. The road width ranges from 5.2 m to 8.0 m in the flat section and 3.5 m to 4.0 m in the rolling section. The average running speed is more than 30 km/hr.

Crossing Conditions:

There are 7 small rivers on the road and temporary bridges exist at 5 rivers but there is no bridge at 2 crossing points. Xe Khampho River is not included in this section.

Socio-economic Conditions:

This part of Route 18A runs in Pathoomphone District (Champasack Province). Even though two NBCA occupied big land area in this district, this district has adequate rice production, and big work force in industry and service sector. Factories of building material are located here. Population within 5km along the route is 445 person/km. From the social aspects, this district in not the poorest among the poor. Literacy rate of Pathoomphone district is 67.4% and student ratio is 18.8%. There is some tourism potential with elephant villages and stone ruins called Phuasa. Good accessibility from Pakse helps development of industry and service sector.

	Table 1.3.2Road Conditions by Route (15/16)						
Route	18 A (ii)	Road Length	L = 39.7 km				
Origin	Border of province	Destination	Xe Piane River				
	(Xe Kham Pho river)						
Surface Typ	pe:						
Earth road	39.7 km						
This road is	second section of Route 18A.						
Terrain Co	nditions :						
This road ru	ins through the rolling terrain	n and mainly passe	es through the forest or copse				
area. There	are some small villages along	the road.					
Road Cond	itions :						
This section	is regarded as a missing link	because vehicles ca	an pass for only 2 - 3 months a				
year. The ro	ad width is also very narrow	with 1.5m to 3.0m	n. The road surface is in a bad				
condition. T	he average running speed in th	nis section is appro-	x. less than 10km/hr.				
The horizon	tal curvature of the existing ro	ad is very small in	some sections.				
Crossing Co	onditions:						
Although 10) small to large-scale rivers cr	ross the road, there	are no bridges at all crossing				
points. Ther	efore, this section become im	passable in a rainy	season. This section includes				
two large-sc	ale rivers; Xe Kham Pho rive	er with 130 m in w	vidth and Xe Piane River with				
100m in wic	lth.						
Socio-econo	omic Conditions:						
This Route	runs between two big rivers v	vithout bridges. Xe	Khampho River and Xe Pian				
River really	separate this area from the res	st of the region. Thi	is area has little population (79				
person/km)	and almost negligible wor	k force in indust	ry and service sector. Rice				
cultivation v	with slush and burn method s	till persists in the a	area. Physical isolation causes				
problems in education health, and accessibility. Literacy rate of the district is 46.9%. Since							
this figure in	nclude the richer part of the d	listrict (the east par	rt of Xe Pian River), reality of				
the isolated area is much worse. Not only the two big rivers but also many streams from							
Boloven Plateau disturb traffic during rainy season. Route 18A runs along the north edge							
of the Xe P	ian NBCA, so big scale land	development mig	ht be restricted. Distinguished				
expected fur	nction of this road link is conr	nectivity. If this lind	k is improved, it will complete				
the connect	on from Vietnam to Pakse a	fter the completion	n of Route 18B. Also, remote				
province of Attapeu could have two-ways (north and west) connection with the other part							
of the national territory.							

Table 1.3.2Road Conditions by Route (16/16)							
Route	18 A (iii)	Road	L = 42.2 km				
		Length					
Origin	Xe Piane River	Destination	Junction of Route 18 B				
Surface Typ	pe:						
Gravel road 37.6 km, Earth road 4.6 km							
This road is	This road is third section of Route 18A.						
Terrain Con	nditions :						
This road ma	ainly runs through the flat terrain,	covered with a	copse or forest area. The road				
also passes i	n some small villages.						
Road Cond	itions :						
The road su	rface of the section between Xe	Piane River an	nd KM post 74.9 km is a bad				
condition with	ith 4.0 m to 4.2 m in road width.	However, the s	ection between KM post 74.9				
km and June	ction of Route 18 B keeps a fair of	condition with	4.0 m to 6.7 m in width. The				
average runn	ning speed in this section is approx	x. more than 30	km/hr.				
Crossing Co	onditions:						
There are 1	5 small and medium-scale rivers	on the road,	ranging from 10m to 85m in				
width, and	temporary timber bridges exist at	t all crossing p	points. Xe Piane River is not				
included in t	this section.						
Socio-econo	omic Conditions:						
This Route runs between Xe Pian River and Samakhixay Town (the capital of Attapeu							
Province). This road serves two districts, Sanaxay and Samaxhixay of Attapeu Province.							
Study team observed that this route run with dense population and rich paddy land along it.							
Population is 683 persons/km. More than 50% of the population along this route is ethnic							
minorities. Large villages of ethnic minorities are found in a narrow strip between this							
route and Boloven Plateau. Rice production is just self-sufficient. Literacy rate of Sanaxay							
is 46.9% and that of Samakhixay is 72.3%. Since this road link is already 12 months							
passable function, improving may not significantly contribute to the accessibility of the							

area.

1.4 Bridges and Structures for Improvement

1.4.1 Improvement Goal for Bridges and Crossing Structures

The goal of the improvement plan for bridges crossing rivers until 2020 is to provide at least a permanent bridge with 2-lane carriageway at all crossing points, which are passable all a year and can accommodate the increase in traffic volume up to the design year. In addition, the load capacity of a bridge should meet an international standard for a trunk road, which can carry a 25 ton class trailer safely.

1.4.2 Bridges and Structures

In total 12 roads or 16 links have been evaluated to establish a Master Plan. These roads have not been improved to all-weather road, including crossing structures. The existing crossing condition at all crossing points is summarized in Table 1.4.1, based on the inventory survey results.

	Rd. No	1G	1H	1J		14A		14A1	14B	14C	14C1	14C2	15	16A		18A		Total
					i	ii	iii								i	ii	iii	
Existing	Nos.	26	0	7	4	0	2	8	15	8	2	1	19	6	3	0	14	115
Bridge	L (m)	532	0	98	140	0	55	148	209	120	125	25	564	207	55	0	445	2,723
Rivers	Nos.	16	0	6	4	2	20	0	15	0	0	0	0	0	2	19	0	84
Bridge	L (m)	767	0	450	165	70	675	0	580	0	0	0	0	0	80	710	0	3,497
Total	Nos.	42	0	13	8	2	22	8	30	8	2	1	19	6	5	19	14	199
	L (m)	1,299	0	548	305	70	730	148	789	120	125	25	564	207	135	710	445	6,220

Table 1.4.1List of Bridges on by Road

*1: There is no bridge on the paved section of Route 1H.

*2: The existing bridges on Route 14B and 15 include 5 and one submergible type in the number respectively.

Source: Study Team

This table shows that 199 crossing points, of approximately 6,200 m total length, are identified. Among them, since 57 crossing points have no crossing structure, requiring approximately 3,500 m total length of bridges to be newly constructed at those crossing points.

All existing bridges listed in the table should be improved in order to meet the improvement goal mentioned above. Because, whereas the major structural types of the existing bridge, which are timber type or and bailey, have only one-lane carriageway and insufficient load capacity for a 25 ton class trailer. The reinforced concrete bridges and steel- I girder bridges, which are a minority among existing bridges, are assumed to have sufficient load capacity, but

only one-lane carriageway.

1.4.3 Bridges and Structures to be Improved on Other Roads

Besides the bridges on the 12 selected roads, there are some bridges or crossing points to be improved on the already paved national roads in the study area to meet the improvement policy for bridges. Four bridge sites or crossing points are identified as a bridge to be improved. A brief description of these projects is given in Table 1.4.2.

Project Name	Crossing Condition	Reasons not to have been improved					
Bridge (Route	3 span bailey bridge with 60m in the	Since that bridge was constructed at similar time					
1I) Houay	total length, constructed in 1996.	of the commencement of ADB-6/4 road					
Lamphan		improvement project on Route 16(1I), ADB					
Bridge		eliminated that bridge from the bridge list to be					
- 0 -		improved in the project.					
Bridge (Route	One span bailey bridge with 24m in the	Since that bridge was constructed at similar time					
16) Houay	total length, originally constructed in	of the commencement of ADB-2 road					
Phakkud Bridge	1995 but replaced in 2001 due to the	improvement project on Route 16, ADB					
0	collapse by the over landed vehicle	eliminated that bridge from the list to be					
	passing	improved in the project.					
Bridge (Route	No existing bridge at the crossing point	The Xe-Kong River bridge is excluded from the					
16) Xe-Kong	of Xe-Kong River with approximately	committed road improvement project from					
river	200m in width. One ferry	Sekong to Vietnam border on Route 16					
	accommodating 4-5 sedan vehicles has	undertaken by the Malaysian private group.					
	been operating almost through a year.						
Bridge (Route	19 small and medium-scale bailey	All bridges were constructed at the same time of					
20) 19 bridges	bridges, from 9m to 69m in the bridge	road improvement project completed in 1994.					
	length, on Route 20 including 5 bridges	Due to the budget limitation and low traffic					
	on Route 1H, with 20 tons load capacity	volume, a bailey type was applied.					

 Table 1.4.2
 List of Bridge Projects

In addition to these projects, the following bridge project was included in response to a request from the Lao side.

Project Name	Crossing Condition	Reasons not to have been improved
Pakse- Xe-don	Five span steel truss bridge with 210m in	The Route 13S bypass was constructed to reduce
Bridge	the total length and 4.5m in width over	the traffic burden of the original Route13S in the
0	Xe-Don River in Pakse. 1m foot path	city area. Accordingly, heavy vehicles use the
	was provided at each side of the	bypass, but increase in local traffic, congestion
	carriageway, constructed in the 1960s.	and delays have increased. Due to the budget
	Due to the narrow bridge width, signal	limitation, improvement has not been
	operation is being undertaken. It allows	implemented.
	only one way traffic and traffic going to	
	opposite direction has to wait for a few	
	minutes before the bridge.	

 Table 1.4.3
 Additional Bridge Project