Ⅳ FEASIBLITY STUDY

CHAPTER 5
ROAD IMPROVEMENT CONCEPT FOR ROUTE 16A

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5.1 Introduction

This chapter describes the road improvement concept for Route 16A, derived from the survey results, i.e., road inventory, natural condition and hydrological survey, used for the environmental and economic for preliminary engineering design. (Table 5.1.3 summarizes the outline of Route 16A)

Route 16A starts from the junction with Route 16 located at the 1.0km mark east of Paksong in Champasack Province and ends at Ban Lak 52, or the junction with Route 1I in Attapeu Province. Total length is as follows, depending on which of the two alternatives is adopted:

- Alternative (i): 64.50km (survey length, not design length*)
- Alternative (ii): 70.05km (survey length, not design length*)

Table 5.1.3 summarizes the outline of Route 16A.

Traffic volumes (inter and intra-zonal trip) for the target year 2020 are shown in Table 5.1.1.

Table 5.1.1 Traffic Volume Forecast Design 2020

Vehicle per day	2,469
PCUs per day for level terrain	2,521
PCUs per day for mountainous terrain	6,081

Note: PCU means Passenger Car Unit

Based on the above PCU figures, a Class III road would normally be recommended for the level terrain and a Class II road mountainous terrain. However a Class III road has been selected for the entire route.

Table 5.1.2 shows the route sections for improvement. Note that the kilometer posts in this chapter are based on the Shortcut Route.

Table 5.1.2 Sections to Consider Improvement Concept

Section	Survey STA.	to	Survey STA.	Survey Length (km)*
(1)	0+000		33+800	33.80*
(2)(i)	33+800		42+200	8.40*
(2)(ii)	33+800		42+200	13.95*
(3)	42+200		58+000	15.80*
(4)	58+000		64+500	6.50*
Total (i)				64.50*
Total (ii)				70.05*

Note: Total (i) is the total length of the Shortcut Route.
Total (ii) is the total length of the Existing Road Route.

Table 5.1.3 Summary of Route 16A

Route	16 A	Road Length	L = 64.5 km in survey length* (Alternative (i))
Origin	Junction of Route 16(East Pakson)	Destination	Junction of Route 1 I(Ban Lak52)

Surface Type : Gravel road 56.1 km, Missing link 8.4km

Terrain Conditions :

This road runs through flat (33.8km), rolling (14.9 km) and mountainous (15.8 km) terrain mainly covered with copse. There are some villages along the road.

Road Conditions :

Note that Alternative (i) is referred to as the Shortcut Route and Alternative (ii) as the Existing Road Route.

(a)There is an existing road structure over the entire route except a section of the Shortcut Route.

(b)From the starting point to the 34km mark, the routes overlap and are located in a hilly area. That is, they both go through the Boloven Plateau, which is 900 – 1,300m above sea level.

(c)The two routes then diverge from the 34km mark and meet up again at the 42km mark of the "Shortcut Route". Note that the section of the "Existing Road Route" that runs in parallel with the section of Shortcut Route that diverges from the Existing Road Route (referred hereafter as the Shortcut Section) is approximately 1.6 times longer than the Shortcut Section. In this chapter, a comparative study of these 2 routes is undertaken.

(i) There is a river that is approximately 50m wide on the Shortcut section. Terrain on this section is generally flat and land-use consists of forest and coffee plantations.

(ii) As for the Existing Road Route, the section that runs parallel to the Shortcut Section goes through 4 villages, with 2 of them for the resettlement of people due to a new hydroelectric power plant project. The horizontal and vertical alignments are inadequate on some parts of this section, which includes an existing bridge approach. Therefore, reconstruction should be considered.

(d)From the 42km to the 58km mark, where the routes once again overlap, the terrain is mountainous and the existing road has an inadequate alignment (i.e., a small horizontal curvature radius and a steep vertical gradient).

Crossing Condition:

In total six small and medium-sized rivers are located on the existing road, five existing Steel I bridges and one bailey type. Therefore, the whole road section may be passable throughout the year, depending on condition.

Socio-economic Conditions:

This road link serves the Boloven Plateau area including Paksong District (Champasack Province) and Saysettha District (Attapeu Province). Population within 5km of the road is 192 person/km. Eastern part of this link has little population along it. Ethnic minorities form the majority of the population, 12,675 along the link. Literacy rate of the district is 62.3% and student ratio is 22.5%. Cash crops like coffee are cultivated rather than rice. Accessibility to the market is already secured with the connection to the Thai border through Pakse. Route 16A contributes to the connection of Attapeu and Sekong province to the western part of the country. Upon completion of Route 18B to the Vietnamese border, Route 16A will contribute to transit traffic from Vietnam to Pakse and to Thailand.

*****The road lengths in this chapter are tentatively determined based on survey work. The preliminary design road lengths based on topographic map developed by the survey are given in Chapter Ⅳ-7.

5.2 Road Alignment, Design and Alternatives

5.2.1 Section (1): STA.0+000 – STA. 33+800 (Survey Length = 33.80km)

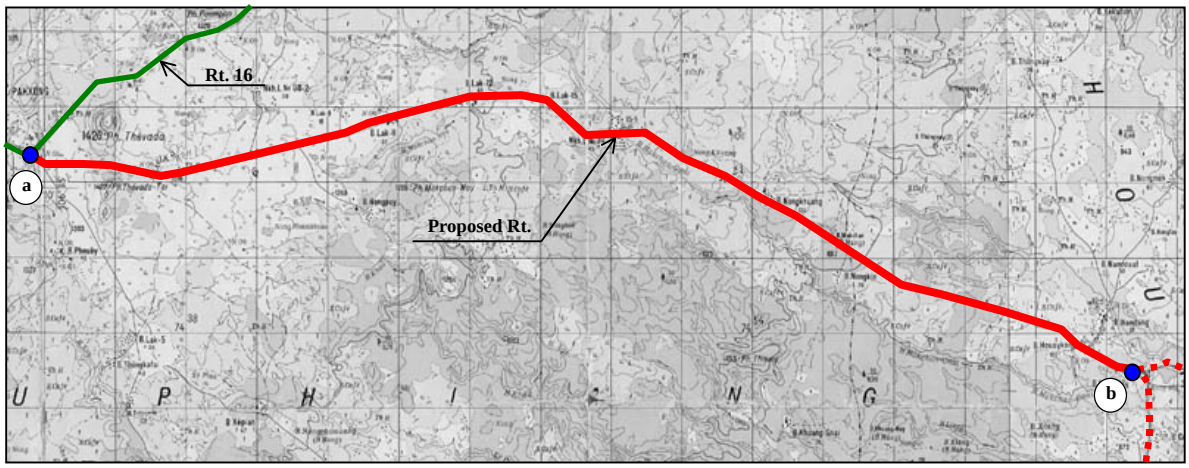

Figure 5.2.1 Proposed Route for STA. 0+000 – STA. 33+800 (a – b)

This section starts from the junction with Route 16 located at the 1.0km mark east of Paksong and ends at Ban Nong-I Oy located at STA. 33+800 (see Figure 5.2.1). The existing road has a gravel surface and a road width of more than 4.5m. The existing alignment has a large horizontal curvature radius and a vertical gradient of less than 2 % on most of the section. Therefore, the work on this section will consist mostly of widening and paving and not earthworks (e.g., excavating and/or embanking).. Figure 5.2.2 shows the typical cross section for this section. Shoulder width is 1.0m on rural sections and 2.0m on populated sections.

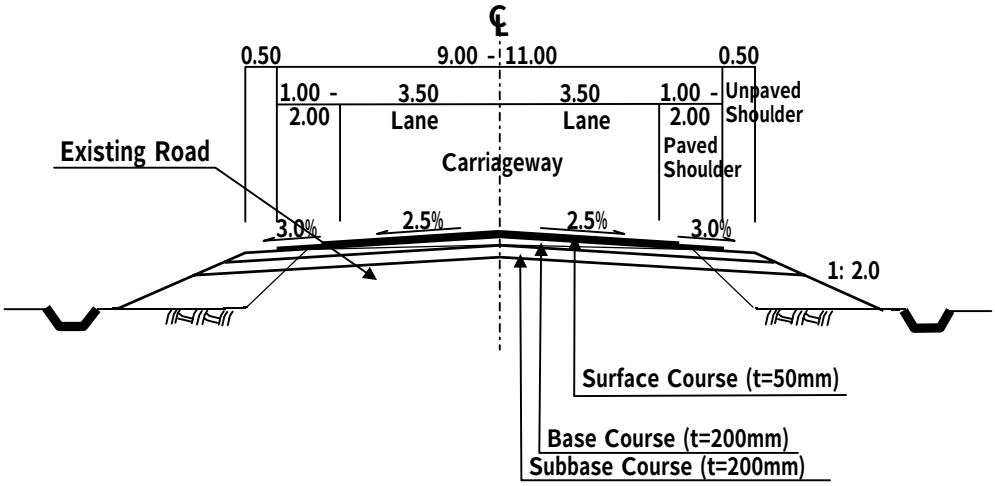

Figure 5.2.2 Typical Cross Section for Proposed Route (L = 33.80km)

5.2.2 Section (2): STA. 33+800 – STA. 42+200 (Survey Length on Alternative (i) = 8.40km)

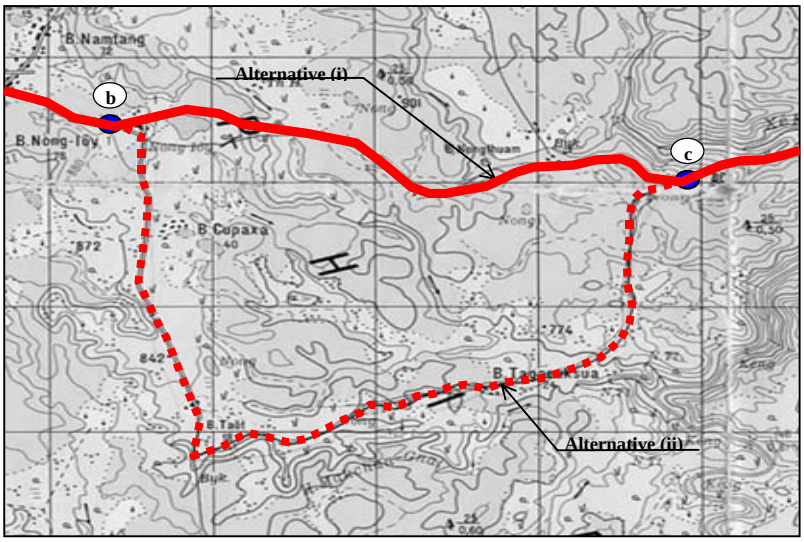

Figure 5.2.3 Alternatives for STA. 33+800 – STA. 42+200

There are two alternatives for this section. Alternative (i) connects point-b (Ban Nong-I Oy) and point-c using the Shortcut Section. Alternative (ii) uses the existing road to connect the same points. Table 5.2.1 contains a comparison of these two alternatives.

As a result of the comparison, Alternative (i) has been selected as summarized below:

(a) Construction cost is lower because the total length of road improvement is shorter than Alternative (ii).

(b) Alternative (ii) needs greater improvement to the horizontal and vertical alignment than Alternative (i).

(c) From the economic point of view, Alternative (i) is more attractive.

Figure 5.2.4 shows the typical cross section for this route. Shoulder width is 1.0 m on rural sections and 2.0m on populated sections.

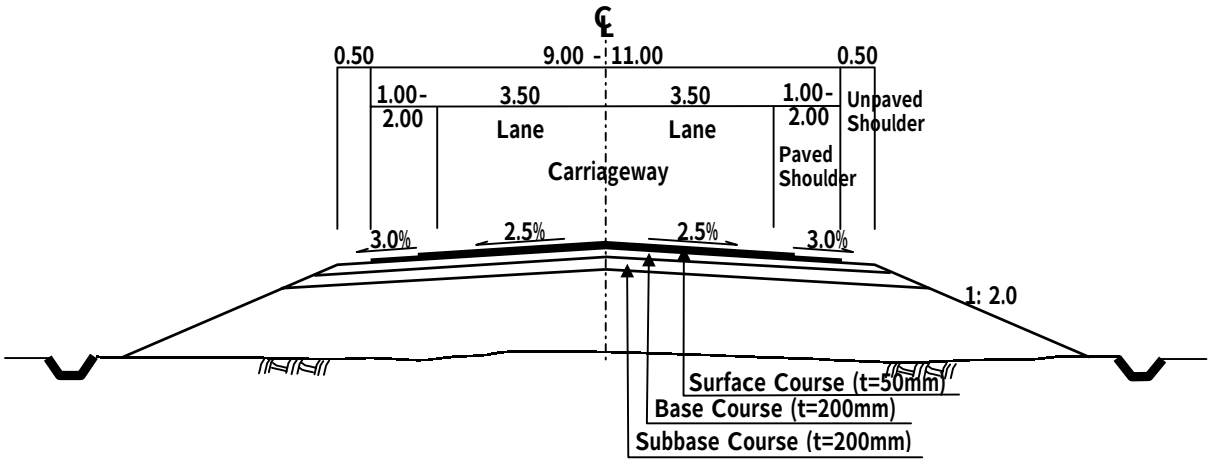

Figure 5.2.4 Typical Cross Section for Alternative (i) (L = 8.40km)

Table 5.2.1 Comparison of Alternative (i) and Alternative (ii)

Item	Alternative (i) (b – c)	Alternative (ii) (b – c)
Outline of route	・Connects point b & c using the Shortcut Section ・6.6km of new road construction ・1.8km of an existing village road improved (W = 1.5m) **(Evaluation: A)**	・Connects point b & c using existing road ・Improvement work of existing road **(Evaluation: B)**
Proposed length	8.4km	13.94km
Current condition of roadside	・Rt. goes through forest area and coffee plantations ・No villages along Rt. ・Many villages north of the Rt. ・Access to northern villages will be improved ・Very few houses need removal ・Land acquisition cost lower than Alternative (ii) **(Evaluation: A)**	・4 villages along Rt. ・2 of 4 villages are for resettlement from hydro-dam site. ・Very few houses need removal ・Small area for land acquisition **(Evaluation: B)**
Bridge Planning	No. of site：１（STA.35+550） Bridge length：30 – 60m **(Evaluation: A)**	No. of site：１（STA.10+380） Bridge length：80 – 100m **(Evaluation: C)**
Horizontal Alignment	・Horizontal alignment adequate **(Evaluation: A)**	・Small horizontal curvature radius at bridge approach (STA.10+380) ・New alignment is shifted to right side. ・Road widening is necessary due to narrow existing road (4 – 6m) ・Large volume of earthworks due to road widening ・Small curvature radius at STA. 13+250 **(Evaluation: C)**
Vertical Alignment	・6% gradient on 2 sections (STA.35+550 & STA.39+200) ・Cut section (Max. H = 25m) at STA.35+550 before river crossing. (i=6%) ・Cut section (Max. H = 15m) at STA.35+550 after river crossing. (i=4.2%) ・Cut section (Max. H = 15m) at STA.39+200 ・Gentle gradient on other sections **(Evaluation: B)**	・Over 6% gradient on 6 sections (STA.1+600, 8+400, 9+100, 10+600, 12+000, 13+400) ・Max. height of cut section is 10m **(Evaluation: C)**
Environmental Impact	・EIA results show minor negative impact to natural environment in spite of new road construction ・Improvement of access to northern village **(Evaluation: A)**	・Minor negative impact due to improvement of existing road ・Access to villages near roadside will be improved **(Evaluation: A)**
Construction Cost	Low **(Evaluation: A)**	High ・Long road length ・Long bridge length ・Long cut section **(Evaluation: C)**
Overall Evaluation	**A**	**C**

Note: Evaluation ranking is from A to C, with A being the highest or best score.

5.2.3 Section 3: STA. 42+200 – STA. 58+000 (Survey Length = 15.80km)

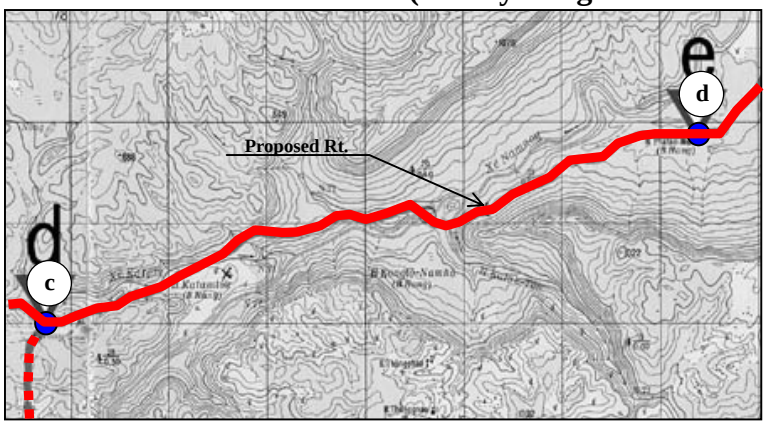

Figure 5.2.5 Proposed Route for STA. 42+200 – STA. 58+000 (c – d)

The existing road is located in a steep mountainous area, and the existing horizontal and vertical alignments do not meet required design standards. Therefore, improvement of these alignments is major consideration. The space for the existing road is only 2 – 5m and it is not at present sufficient for the proposed road construction. It is recommended that the road alignment shift to the mountainside to avoid a high embankment structure. This will ensure the stability of the road structure. Guardrails and traffic signs will be very important to prevent traffic accidents. Figure 5.2.6 shows the typical cross section.

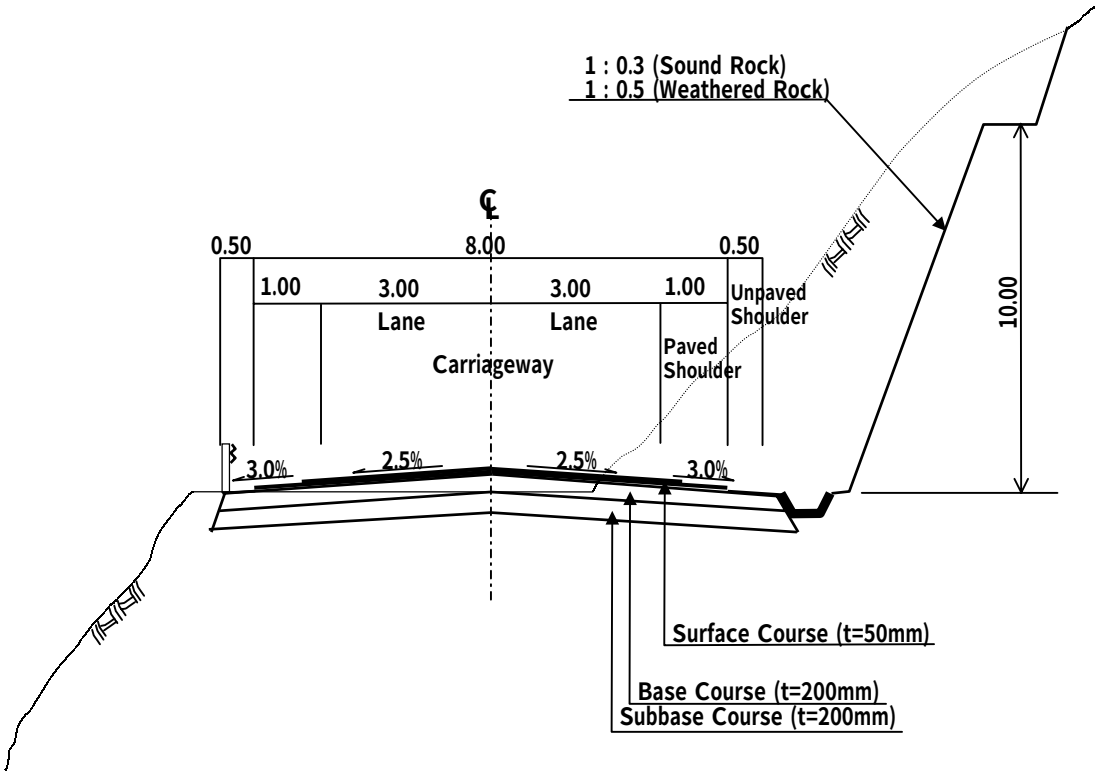

Figure 5.2.6 Typical Cross Section for Proposed Route (L = 15.80km)

5.2.4 Section (4): STA. 58+000 – STA. 64+500 (Survey Length = 6.50km)

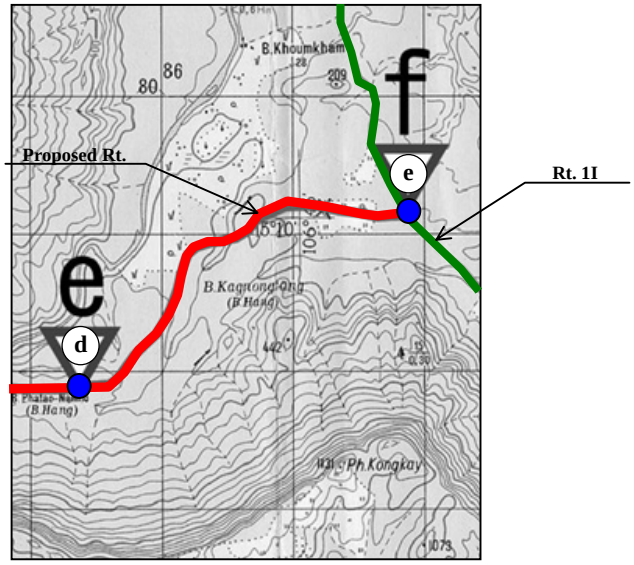

Figure 5.2.7 Proposed Route for STA. 58+000 – STA. 64+500 (d – e)

The terrain is level on this section and the horizontal and vertical alignments of the existing road meet design standards for most of this section. The typical cross section improvement is shown in Figure 5.2.8.

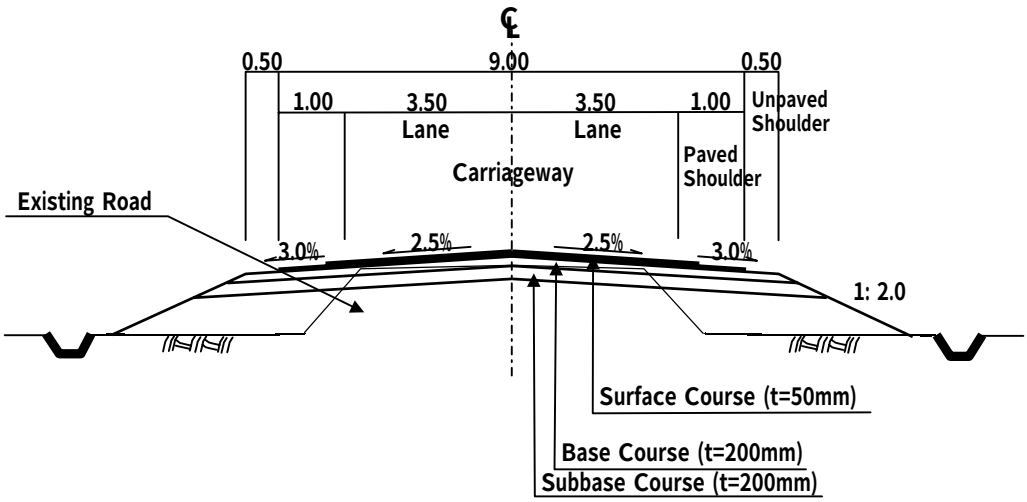

Figure 5.2.8 Typical Cross Section for Proposed Route (L = 6.50km)

5.3 Bridges and Structures

There are seven rivers and streams to be examined on the application of crossing structure. All rivers on Route 16A have rapid flow and the riverbed is covered with boulders. However, each river has a unique feature. For example, whereas Xe Namnoy River has a large catchment area and its discharge reaches to approximately 3,000 m3, Huay Katak-Tok (Huay Ho) has a dam for hydroelectric power generation at 19km upstream.

Five existing bridges are of more than 24m total length. A bailey bridge should be replaced by new a bridge with sufficient lane width. Four existing steel-I beam bridges should be examined as to whether they can be used in the future. Two new bridges should be constructed at locations No.2 and No.7 where there is no existing bridge.

Table 5.3.1 Structure Type on Rivers on Route 16A

No	River Name	Km post	Village Name	Existence	Existing Bridge				River Conditions			Structure Type
				of Bridge	L(m)	Width(m)	No. of Span	Br. Type	Width(m)	HWL(m)	Gradient	
1	Huay Mckchan-Gunang	17.575	Ban Chansavang	Yes	25.0	4.5	1	Bailey	25.0	2.9	1/100	Bridge
2	Huay Namtang	35.550		No	-	-	-	-	27.0	4.7	1/100	Bridge
3	Xe Katam	45.997		Yes	48.4	4.5	4	Steel-I	45.0	6.2	1/50	Bridge
4	Xe Namnoy 1	51.655		Yes	60.4	4.5	4	Steel-I	60.0	7.7	1/50	Bridge
5	Xe Namnoy 2	51.845		Yes	24.2	4.5	2	Steel-I	24.0	3.5	1/500	Bridge
6	Huay Katak-Tok (Huay Ho)	52.175		Yes	24.2	4.5	2	Steel-I	24.0	5.4	1/50	Bridge
7	No Name	61.473	Ban Lak 56	Yes	-	4.0	-	Culvert	15.0	GL+1.0	1/50	Bridge

5.4 Outline of Road Improvement Project

The length of the proposed route is 64.50km, subject to the results of preliminary design. Improvement approach, major work items and measures to mitigate negative impacts to be studied are as shown in Table 5.4.1. Preliminary design has been undertaken on this basis.

Table 5.4.1 Improvement Approach by Section

Section	Survey STA.	To	Survey STA.	Length (km)	Improvement Approach	Major Work Items	Issues to be Studied in the Design Stage
(1)	0+000		33+800	33.80	Improvement of existing Rd.	・ Widening ・ Pavement	
(2)	33+800		42+200	8.40	New Rd. construction	・ Cut ・ Pavement	・ Provide access Rd. to villages
(3)	42+200		58+000	15.80	Improvement of existing Rd.	・ Cut ・ Pavement ・ Improve of alignment	・ Install traffic safety facilities ・ Slope protection
(4)	58+000		64+500	6.50	Improvement of existing Rd.	・ Embankment ・ Pavement ・ Improve of alignment	
Total				64.50			

CHAPTER 6
EVALUATING ENVIRONMENTAL IMPACTS

CHAPTER 6 EVALUATING ENVIRONMENTAL IMPACTS

6.1 Introduction

Based on the Master Plan discussed earlier in this report it was determined that Routes 14A and 16A would be further examined. The routes must be seen as representing a high priority of the national government in the southern part of the country. It is within this context that the Initial Environmental Examination (IEE) reports were prepared for each route. It must also be recognized that the environmental dimensions of the project are but one input into the final design and location of the road. It is clear that financial considerations, technical imperatives, the objectives and concerns of various national and provincial officials are all important ingredients in the choice of the final route and its design.

The two IEE reports are provided in the ANNEX F-6, F-7 and this chapter summarizes some of the key points raised in the two IEE reports.

6.2 IEE Assessment Methodology

6.2.1 Socio-Economic Survey

The surveys were carried out over using a questionnaire developed. The cooperation of local governments was obtained in helping to facilitate the process. Sixteen villages (250 households) on road 14A and twelve villages (150 households) on road 16A were interviewed.

6.2.2 Water Quality Survey

The water quality survey task required the collection of baseline information on the river surface water and the ground water crossing Routes 14A and Route 16A in the southern region of Lao PDR.

The samples for the dry season were collected in May 2002 and the samples for the rainy season were collected during in August 2002. Sampling occurred at six points.
The survey methodology met the requirements of relevant laws, decrees, guidelines, and advice of the related authorities. The survey was carried out with standard field research techniques to collect and test the following factors: pH, Conductivity, TDS, DO, BOD, COD,

Phosphate, Nitrate, Turbidity, Permanganate Value, Total Coliforms, Presumptive E-Coli, Alkalinity, Iron, Manganese, Copper.

6.2.3 Physical, Cultural, Economic and Ecological Environmental Assessment

The IEE studies used a full range of methods to gather relevant information including examining the work from the Master Plan, discussions with relevant stakeholders as listed below, conducting a major social and economic study through the survey of a number of communities along the road, water quality studies, and a thorough assessment of the physical, cultural and ecological impacts of the project. It is important to note that the project is very much concerned with minimizing any negative impacts. The Project should be equally concerned with achieving the potential benefits that the significant investment in road construction and improvement will provide for the overall social and economic development of the country and the people in the immediate area and the province.

A number of stakeholders were consulted including the following:

- Science, Technology and Environmental Agency (STEA)
- National Tourism Authority of Lao PDR
- Ministry of Agriculture and Forestry
- Ministry of Information and Culture
- Local and provincial governments in Champasack
- Women's Union
- Ministry of Health
- Urban Research Institute
- Ministry of Education
- Lao Front from National Construction
- Ministry of Industry and Handicraft
- National Committee for Control of AIDS
- International organizations – ADB, IUCN, UNESCO, UNDP, SUNV-UNDP and WWF.

In order to organize the assessment process each route was divided into sections as can be seen in Figures 6.2.1 and 6.2.2.

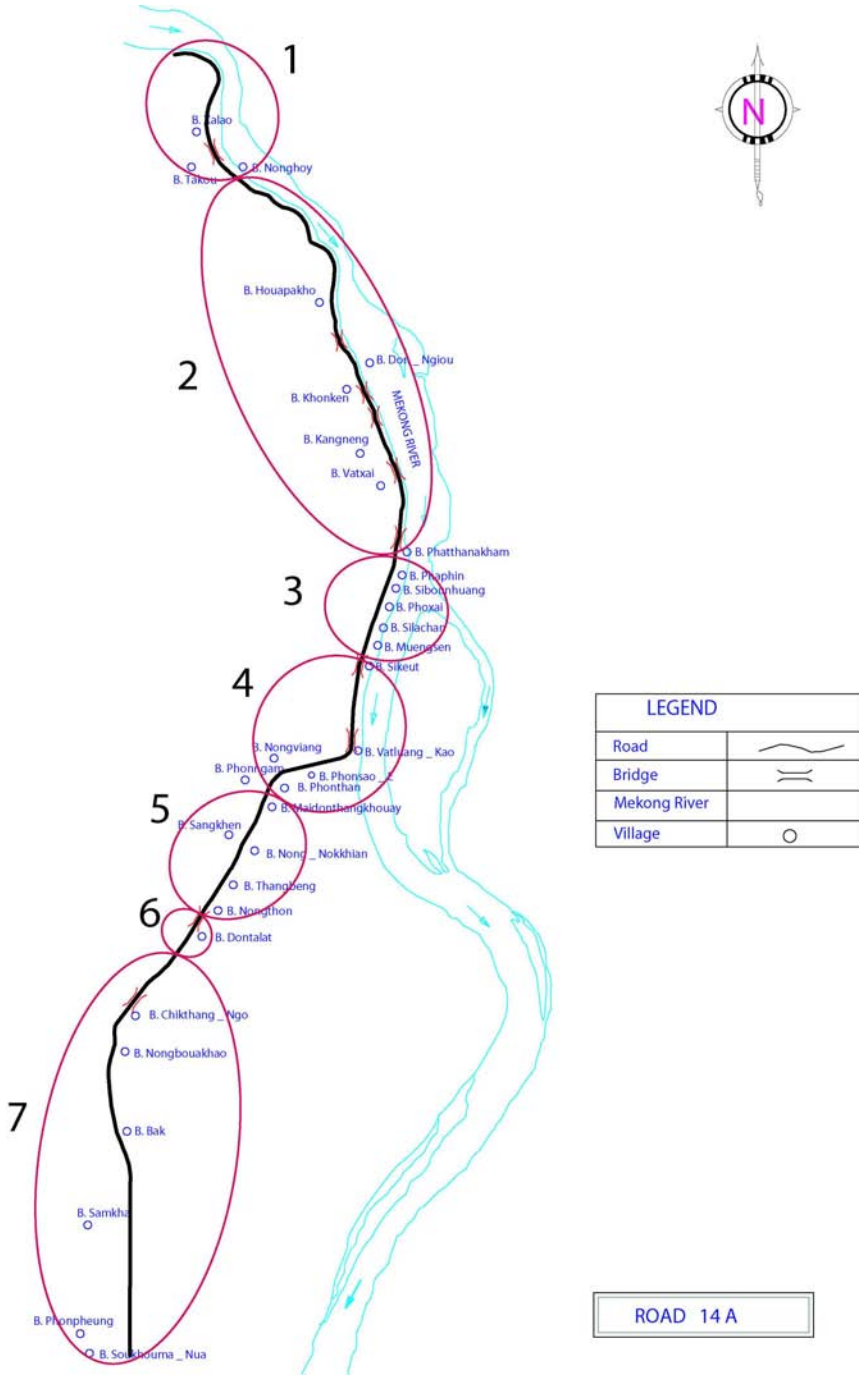

Figure 6.2.1 Route 14A Sections

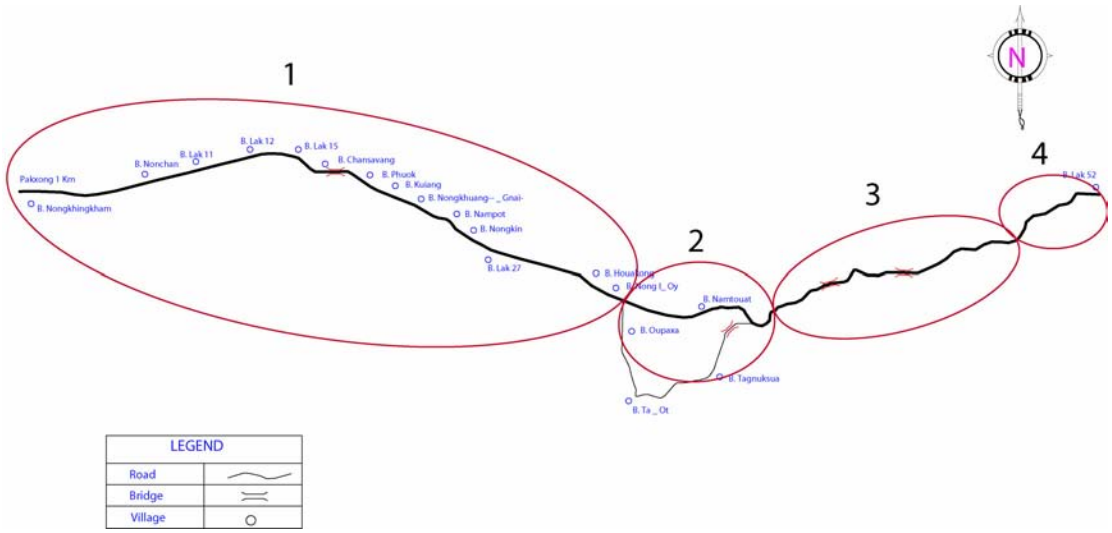

Figure 6.2.2 Route 16A Sections

6.3 Major Environmental Issues for Route 14A

Specific impacts in the case of Route 14A are related to culture and historical characteristics of the area. It is important to note that Champasack Town, Wat Phou, the Ancient City and the surrounding landscape form part of the protected area of the world heritage site as identified by the UNESCO in the Champasack Management Plan.

6.3.1 Champasack Town

The townscape of Champasack Town is recognized as having international significance. It represents an important cultural landscape that must be respected. This significance has been recognized in the road design process and the construction of a new road along the provincial road will ensure that the construction process does not in any way destroy this cultural landscape. The increased visitation to Wat Phou will have a potential negative impact on the community if development is not properly managed and controlled. There can be no argument that there is the potential to provide for the economic benefit of the local people through tourism development. However, there is also the possibility that attempts to meet the needs of the tourists (provision of hotels, restaurants, retail services etc.) within the existing village environment could have negative impacts on the physical characteristics of the community.

6.3.2 Wat Phou and Ancient City

Wat Phou is of the highest cultural significance not only for the country but for world heritage purposes. The significance of the site has been recognized internationally and a very comprehensive plan has been prepared for the management and protection of the cultural resources. Given the national decision to improve Route 14A the challenge is to protect this heritage while accommodating the road. It is also recognized that the improvement of the road and access to Pakse will provide increased access to a wide range of visitors thereby both improving the local economy and providing visitors with the possibility of experiencing the heritage value of the site.

The increased visitation should also allow heritage interests to obtain further resources to carry out conservation and interpretive work at the world heritage site.

The alignment that has been chosen avoids the Ancient City and has the immediate benefit of removing any further pressures on this important dimension of the overall cultural landscape. The overall alignment that has been chosen and approved by both the Ministry of Information and Culture and the UNESCO is sited in such a way as to avoid any significant visual impacts.

It is recognized that increased access to the site will bring with it the negative impacts that normally come about from increased visitation. All measures must be taken to protect the significance of the site through proper visitor management.

With the proposed bypass route in section 3 at Champasack town people living on the existing road will not benefit from the improved road conditions. It is important that the local community be connected to the new road alignment.

6.4 Major Environmental Issues for Route 16A

There are two sections of new construction along Route 16A. The first is through Section 2 where in one location (approximately 8.4 km) there is a significant intervention that is necessary in order to accommodate access to a bridge that must be constructed.

In section 3 there are significant physical disturbances**.** There is no doubt that the

disturbances in road section 3 constitute a significant physical impact given the fact that in this section 30% of the physical environment will be disturbed. In some cases the physical disturbance is of significance. Since there is not information available that documents the ecological systems nor the plant ecology in these locations it is impossible to gauge the impact of the planned improvements. It is important to note that this area is not included in any of the national inventories nor is it a nationally protected area.

There is an impact on the visual environment. Given the level of disturbance the character of the environment will be seriously altered in some instances.

While it would be preferable not to subject the environment to this level of intervention there are a series of imperatives that drive the detail design process. The first and most important is that after an exhaustive study of all of the roads in southern Lao PDR this route has been chosen along with 14A as having the highest level of priority for development given economic and social development purposes. While the standard for national roads is designed to accommodate speeds of 80 Kph the design speed of this section through the Boloven Plateau has been reduced to 40 Kph in order to protect the natural environment. However, even with a 50% reduction in speed there are still requirements to undertake the construction work as outlined in order to provide the necessary performance and safety requirements.

With the proposed shortcut route in section 2 people living on the existing road will not benefit from the improved road conditions. Some of these people may already be moving to the new settlement, which is presently being built on the existing road and it is important that this new community be connected to the new road alignment.

6.5 Planning and Design Stage Impacts (Pre Construction)

6.5.1 Land Acquisition

The Project will require some agricultural land for project implementation on road 14A sections 1,2,3, 4 and 6, and there will be a need to acquire some land at road 16A section 2. This matter has been discussed with the provincial governor as well as MCTPC and there are no problems foreseen in acquiring the necessary land. However, since detailed designs of the road are not being developed, the Project is not in a position to provide the exact requirements for and the costs of acquiring the agricultural land at this moment.

6.5.2 Resettlement

A limited level of relocation will be required on road 14A sections 3 and 6, and there is a possibility of small-scale relocation at road 16A section 2. The exact requirement will be determined once detailed design work is completed.

The government declared a 50meter right-of-way on all national roads in the early 1990s. When the residents were questioned during the Socio-Economic Survey there was general awareness of these provisions and most people that were interviewed viewed some moving as a cost of obtaining the advantages related to an improved road. The respondents indicated they would willingly relocate their structures outside of the right-of-way with their own resources before project construction commences.

Relocations will generally be less than 50 meters and can be managed at the village level. While compensation is not payable under Lao law, budgetary provisions should be made to assist households that experience hardship as a consequence of relocation.

6.6 Construction and Operational Stage Impacts

During the construction and operational stages there will be impacts on the surrounding communities particularly if proper control procedures and regulations are not put into place.

The object of the construction process must be to minimize unnecessary impacts on the surrounding populations. Providing adequate information about activities will be seen as an important element of dealing with the impacts of the construction work. It is particularly important that special care must be taken during construction in the Wat Phou and ancient city area of road 14A. The challenge during the construction phase must be to prevent any cultural resource damage. In the environmental management plan procedures and regulations for minimizing impacts are proposed. In the case of 16A there will be a physical disturbance in the mountainous area, which will need special attention during the construction process. The common impacts for both routes are discussed below.

6.6.1 Physical Environmental Impacts

(1) Air:

Dust will be a nuisance created by the construction activities to a greater or lesser extent and will affect air quality. During the operational period depending on local conditions there may be some increased levels of pollution from vehicles.

(2) Noise:

Construction activity could cause disturbances to nearby properties but they will be minor and short term in duration. There could be a possibility of increasing noise levels during the operational period if the traffic is not effectively controlled and if the road is not well maintained.

(3) Contamination of Water from Construction Waste:

If proper controls and procedures are not put into place there may be negative impacts on surface water quality during construction caused by runoff from material storage areas, emissions from machinery, and domestic sewage from the construction workers.

(4) Soil:

There are four new and two existing borrow pits for road 14A and one new and five existing borrow pits for road 16A being proposed for this project. Soil erosion could be a problem from the location of quarries and borrow pits and earthwork related activities. In the mountainous area soil conditions will be affected through cut and fill operations. Erosion and earth slippage could be a problem if careful and immediate re-vegetation and slope stabilization measures are not instituted.

(5) Traffic Disturbance:

Traffic disturbances will occur during the construction process. Traffic control by local authorities and the contractor will be essential in order to minimize the impact of construction activities to the local people.

(6) Visual Effects:

Visual impacts including road cuts, oil disposal and poorly managed borrow pits are potential impacts of the road construction process unless proper management techniques are used. The visual impacts of the road improvement works will be minor in most cases. On several

recently completed road improvement projects laterite borrows have left unsightly scars on the roadside landscape that must be avoided in this project.

6.6.2 Ecological Impacts

In the case of road 14A there are no apparent ecological impacts given the already disturbed nature of the area. Although the project has to construct a new road in section 2, it will cut through what is largely a paddy field. The construction process of proposed bridges, piers and their locations could have negative impacts on the migratory patterns of the fish and aquatic ecosystems.

In the case of road 16A there will be possible impacts during the construction and operational stages as discussed in Section 6.4.

(1) Loss or Damage of Ecological Resources:

Construction activities will result in the removal of trees for widening the existing road and all care must be taken to reduce this removal. It is also possible that the setting up of temporary construction sites can have negative impacts on the existing environment.

(2) Impacts on Aquatic Environments:

The construction process of proposed bridges, piers and their locations could have negative impacts on the migratory patterns of the fish and aquatic ecosystems.

(3) Impacts from Hazardous Spills:

There is a possibility of ecological impacts during the transportation of hazardous materials that an accidental spill may occur. Special care and control measures must be put in place to deal with these occurrences.

(4) Increased Funds for Natural Resource Conservation:

One of the important possible positive impacts of increased visitation from future tourism development in the mountainous area will be that there will be more money made available for conservation and interpretation efforts.

6.6.3 Cultural Resources Impacts

Possible cultural resources impacts on Wat Phou and Ancient City from construction and improvement of road 14A have been described earlier in Section 6.3.1 on the specific issues.

In the case of road 16A the Ministry of Information and Culture is not aware of any sites of cultural resource significance. Without a process of archeological investigation it is therefore not possible to identify any potential negative cultural impacts at this point.

6.6.4 Socio-Economic Impacts

(1) Quality of Life and Conditions of Local Girls and Women:

As has been discussed earlier it is anticipated that the road improvement project will improve the quality of life of girls and women by providing better access to schools, health care centers and government services. However, in order to ensure that the conditions of girls and women are improved after the completion of the project, the government will need to provide supporting programs in the areas of health, education and economic development. There is always the threat of sexually transmitted diseases from temporary workers and it will be necessary to ensure that both awareness programs and preventive measures are made available.

(2) Encouraging Economic Development on Road 14A:

If properly managed the construction process can help to create job opportunities for local people during the construction process. While for most people the introduction of an improved road will lead to the potential for increased income and therefore a better quality of life some may be disadvantaged by the location of the road. In road section 6 at Ban Dontalat the proposed bypass may cause a loss of business for vendors and retailers along the existing road. There is recognition from stakeholders and communities that the increased access will encourage higher levels of tourists visiting the Wat Phou World Heritage Site. In fact in the Champasack Heritage Management Plan there is recognition of the importance of tourism and the plan presents ways of accommodating this tourism activity.

(3) Encouraging Economic Development on Road 16A:

There are encouraging signs that opportunities for agro-tourism related to the coffee plantations will be facilitated by the construction and improvement of Road 16A. As will be

argued in the environmental management plan it will be important that economic development assistance be provided to ensure the success of the economic development initiatives.

In all discussions with stakeholders as well as the communities there is recognition that the increased access will provide for higher levels of tourists to the region. There have been no studies carried out to look at the actual tourism potential of the area and the scale of tourism that could be anticipated. There are clearly the necessary natural resources but whether the market exists and how these markets can be exploited must be further determined.

The increased access to Se Katam Tok Waterfall will provide an opportunity for ecotourism development that should bring additional visitors who will provide the potential for increased economic opportunities for people. It must also be recognized that this increased tourism activity if not properly managed and planned can have significant negative impacts and more importantly little positive impacts for the local people.

(4) Health Impacts:

The present lack of all weather access limits the opportunities for all residents to access health services. With the introduction of an all weather road there will be increased opportunities to access existing health services. As will be discussed in the environmental management plan there must be a conscious effort made to ensure that the increased access is matched with other initiatives in order to assure a higher quality of health throughout the area of the road.

The main health risks during the construction stage may arise from the introduction of AIDS, sexually transmitted or other diseases by immigrant workers.

Large trucks transporting raw materials during the construction period must be seen as an important safety threat to the residents. There is also the possibility of transporting hazardous materials along this road in the future. Without an adequate accidental spill management plan, spills of hazardous materials could be seen as a major problem to local people.

The UXO hazard is seen as a risk to socio-economic activities and quality of life of local communities as well as during the construction process.

(5) Improving Access to Educational Services:

As reported in the socio-economic survey the lack of an all weather road is a major reason why children do not attend school on a regular basis especially during the rainy season. The improved road will improve access to schools with shorter travel times which should encourage children to go to school thereby raising education levels in the future. It is recognized that other measures as well as societal attitudes will form an important part of ensuring that the road construction meets its educational goals.

(6) Better Access to Government Services:

Better road conditions will increase opportunities to access government services. This is particularly important since in the survey people indicated that this was one of highest uses made of the existing road.

(7) Cultural Impacts on Local People:

In-migration facilitated by the improved road can have undesirable consequences when the influx of newcomers leads to possible undesired changes in traditional ways of life and displacement of groups or individuals who do not have formal ownership papers for the land they occupy. Changes should be documented and assessed in order to avoid negative impacts.

6.7 Planning and Design Stage Mitigation Measures

(1) Resident Consultation and Participation:

In order to ensure that the road construction meets the needs of the local people and does not negatively impact their existing social and economic conditions it is essential to have an ongoing process of discussion and information sharing with local residents. This must range from major issues such as compensation and resettlement to more localized problems such as ensuring that the road does not directly negatively impact individual families. Given the changing nature of community needs it is essential that during the construction process this consultation process be undertaken in a comprehensive matter. This will require that staff from the Department of Roads as well as other ministries and departments be involved in the process. It will also be important that staff from these departments and ministries be trained in order to be able to effectively deal with the feedback and that a forum be provided for the local residents to voice their concerns.

It is also equally important however to consider that the road serves national, provincial and

district needs and that there will be instances where decisions must be made that may not be in complete accordance with the views and perspectives of local people. In these instances it is vitally important that solutions with the minimum negative impacts be sought.

During the construction phase it is essential that residents be kept informed of activities and that they be alerted to any of the potential negative impacts that may come from temporary construction activity. Contact points in various villages along the road will be established where village heads and/or local people can communicate their concerns directly.

(2) Public Information Program:

The project will ensure that a public information program is put in place. Local people will receive relevant information regularly during both the pre-construction and construction period. Information disseminated to local people will be in an easily understandable format using various media such as a poster, radio, public hearing and local officials. Necessary information should include the following:

- A clear description of the negative and positive impacts that will occur during construction period.
- The development and implementation of transparent compensation procedures.
- Information on plans and a timetable that is updated on a regular basis.
- Information and consultation with local people on activities which could disturb their daily life. This would be particularly true of activities such as blasting or transporting hazardous materials used in the plant
- Making people aware of the traffic control measures.
- Providing residents with the results of the ongoing monitoring process.

(3) Land Acquisition Plan:

Before construction begins a land acquisition plan must be in place and implemented.

(4) Resettlement Plan:

While there is no large-scale resettlement that will occur in the project there will be instances where some small-scale moving on road 14A and 16A may be required. There may be some voluntary resettlement that will occur. In whatever resettlement that occurs it is important that MCTPC ensure that the quality of life of the families affected by the project implementation is not in anyway diminished. In other words as a result of resettlement those directly impacted must be at least as well-off as they were prior to the resettlement process.

The MCTPC resettlement plan should place an emphasis on public participation and must include a clear articulation of resettlement policies and principles of compensation for affected families. A monitoring program must also be established to ensure that the resettlement plan is implemented within the timeline provided for in the plan and to ensure that the affected villagers are satisfied with the compensation process.

(5) Compensation:

There are a number of possible impacts on the local people that must be considered in the compensation process. In some cases the impacts may be relatively insignificant such as the loss of a tree or the need to move a house back by several meters in order to accommodate the improvement of the road. Compensation for affected people could be in kind (extra land or materials) or in cash for losses sustained.

6.8 Construction and Operational Mitigation Measures

Based on the nature of the possible impacts identified earlier these regulations and guidelines are designed to mitigate negative impacts and to ensure the positive impacts to the local communities. It is assumed that international standards and practices are adopted in construction operations.

6.8.1 Physical Environment Design/Engineering Criteria

The MCTPC will ensure that contractors follow regulations and guidelines to minimize/avoid any pollution from construction and operation activities on the environment. In order to ensure that the regulations and guidelines are followed a monitoring program must be put in place.

(1) Air:

Contractors will be required to follow the guidelines below in order to prevent dust pollution during construction period.

- Water will be sprayed on the construction sites and major feeder roads twice a day during the dry season.
- All vehicles delivering granular or fine materials to the site are to be covered to avoid spillage.
- Brick, asphalt and concrete plants will be operated within the terms of government

pollution control legislation, and located as far away from settlements as possible.

- All vehicles used for construction must be regularly and well maintained.
- The emission levels from equipment and vehicles must comply with national emission standards.
- Plants and equipment shall be well maintained using dust collectors whenever this is necessary.
- Roads used by contractor to transport materials are to be kept clean and clear of all dust and mud.

To control an increase of air pollution levels from vehicles during the operational stage the MCTPC will have to maintain roadside tree plantations and vehicles on the road should be tested for emission pollutants.

(2) Noise:

Contractors will be required to follow the guidelines below in order to prevent noise pollution during the construction period.

- All construction equipment should have well-maintained muffler systems and be operated within design limits.
- Limit on nighttime work in populated area
- Special noise generators such as mobile crushing and mixing facilities should be located at least 2 km. from the nearest community.
- Noise levels from construction activities must comply with the national standard.

During the operational period overloaded vehicles on highway should be prohibited in order to avoid excessive noise levels from vehicles. Roadside planting using densely leafed shrubs and trees should be provided in order to allow for noise attenuation should this becomes necessary based on the monitoring process.

(3) Water:

All measures will be taken to prevent the wastewater produced in construction from entering directly into watercourses. Contractors will be required to follow the below guidelines below in order to avoid any pollution to watercourses from worker camps and construction activities.

- Chemicals and oil will be stored in secure and impermeable compounds well away from surface water.
- Construction camps will be equipped with sanitary latrines that do not pollute surface

water.

- Discharge of sediment-laden construction water into surface water will be forbidden. Such water will be discharged into settling tanks and treated prior to final discharge.
- Construction work close to the water bodies shall be avoided during heavy rain periods.
- Discharge standards shall be strictly adhered to by the contractors.

During the operational phase these preventive measures must be incorporated into the design and implementation dealing with runoff should be maintained in order that this runoff does not flow directly into watercourses. Proper maintenance must be implemented that allows runoff to flow over grassed or pervious areas in order to permit the settling of fine materials, retention of oily matter and a reduction in volume and rate of flow.

(4) Soil:

Prior to using borrow pits, the MCTPC will ensure that the contractor prepares a plan, which includes details of excavation, materials processing, handling, means of transporting modes and defines how environmental impacts from these activities will be mitigated.

During the construction process the excavation work that will be necessary in the mountainous region of the Boloven Plateau on road 16A must be carefully monitored. Excavation work on the steep slopes will not occur during the rainy season in order to avoid the possibility of serious erosion from earthwork activities.

Earthwork operations should be strictly managed by the contractors as per design requirements. Material generated from excavation will be removed to areas approved by the MCTPC and Department of Forestry, and under no circumstances will be dumped in adjacent locations. The contractor shall ensure that the method of stock pilling materials, use of plant and siting or structure of temporary buildings do not adversely affect the stability of excavation or fills.

On road embankment slopes, slopes of all cuts, etc., shrubs and/or grass will be planted. On sections with high fill and deep cutting in the mountainous area the side slopes will be graded and covered with bush and grass, etc.

(5) Management of Traffic:

Local authorities will control traffic to avoid traffic disturbance during the construction period. The contractor shall provide safe and convenient passage for vehicles, pedestrians and livestock. It is necessary for contractors to provide information on construction program and transport schedules to the local people.

(6) Minimizing Negative Visual Impacts:

Rehabilitation and re-vegetation of borrow pits must be carried out in order to avoid visual impacts to the surrounding areas. Retaining walls to stabilize the slopes must be carefully designed in order to respect the special scenic value of this particular environment. It is essential that the design be carried out in such a way as to complement the quality of the environment and that standard construction techniques may not be appropriate in this important natural environment.

6.8.2 Protection of Ecological Resources

(1) Minimizing loss or damage on ecological resources

It is assumed that the design for the route 16A through the mountainous area of the Boloven Plateau will have adopted the necessary environmental controls and standards suggested by the environmental consultant. During the construction phase the Ministry will ensure that the contractors adopt the following guidelines:

- Restrict road improvement activities within the easement designated by the road design strategies.
- As identified in the design strategies forest cover must be maintained as closely to the edge as possible on either side of the road. Excessive stripping should be avoided.
- Construction workers should be instructed to preserve natural resources and not to use firewood from local forest.
- Construction workers will not be able to enter into the area outside of the designated zone without the permission of the Ministry of Forestry.

Since there will have to be the removal of certain vegetation species during the construction process budgets will be allocated to replace the vegetation either with the existing plant

materials or with similar species. It would not be acceptable to lose the vegetation that helps to form the basis of this important scenic resource. This will require that specialists (preferably plant ecologists) be involved in the removal process and replanting in order to ensure that as much as possible of the original character is maintained.

(2) Protection of Aquatic Environments

Before any road construction takes place a careful inventory must be carried out of the fish species in the major watercourses identified by the Ministry of Agriculture and Forestry. There is no doubt that the construction process could have negative impacts on the aquatic ecosystems if there is little or no knowledge about the significance, behavior and sensitivity of the fish stocks. Based on this inventory construction schedules must be adjusted in order that there are no significant negative impacts on the migratory patterns of the fish. This may require that at certain times of the year that the flow of the river not be impeded and that all possible measures be taken to ensure the normal migratory patterns can occur. It also must be assured that the placement and size of piers does not in any way alter the ecosystems that have been identified as being of significance by the Ministry of Agriculture and Forestry.

It is also important that the means of dealing with drainage be carefully considered in order to ensure that the water reaching the rivers do not contain contaminants either from the construction or operational process. Water must be carefully tested in order to ensure that the ecological systems are not being upset due to construction or operation activities. Since baseline information has already been obtained during the IEE process the testing process could use this information as the basis to assess differences in water quality over a period of time.

(3) Protection Against Hazardous Spills

During the operational period there is the possibility of spills of hazardous materials which could affect nearby ecological resources. The MCTPC will ensure that the delivery of hazardous substances will require a permit license. Road safety programs and a spill contingency and emergency plan for hazardous and toxic materials will be put into place.

(4) Allocation of Funds for Environmental Conservation

It should be recognized by the relevant authorities that in order to cope with increased visitor numbers and to improve the quality of ecological resources that additional funding for conservation will be required. Allocation of additional funds will be necessary in order to ensure that resources are well managed and controlled; do not exceed carrying capacities,

thereby avoiding future negative impacts due to the high visitation levels.

6.8.3 Protection of Cultural Resources

The Champasack Heritage Management Plan is a comprehensive document that not only identifies the heritage value of the site but puts forward a detailed management plan. The first recommendation of this Environmental Management Plan is that the Champasack Plan be adhered to and implemented in all its dimensions. It is not possible within this Environmental Management Plan to do other than to strongly support the professionally developed and nationally recognized procedures and measures put forward in this Plan. It is important to note that the Provincial Decree on the Regulations for the Preservation of the Historical Site of Wat Phou and the Areas Related to Wat Phou No.38/88 be seen as the enabling legislation that supports the management plan referred to earlier. (This document is provided in ANNEX F-15.) This Decree along with the Plan provides the necessary protection and development measures both during the construction process as well as in the operational stages of the road.

There is concern about the impacts of tourism on the site. It can only be recommended that the protection zone regulations be adhered to and that all the necessary national and provincial regulations be put into place in order to ensure that tourism development does not infringe on this cultural landscape.

It has been agreed that an archeological survey will be undertaken in sections 2, 3 and 4 during the basic design stages of the road. The survey will be undertaken by The Ministry of Information and Culture and will identify areas of cultural sensitivity. In cooperation with the road designers the alignment will then be specifically determined in order to avoid any impact on major cultural resources. There will be instances where individual artifacts may be found and their location carefully documented and removed for preservation and interpretive purposes. Where major archeological sites are discovered there will be a protection zone of 40m implemented in order to avoid any negative impacts.

During the construction process the following actions will be taken:

- Given the importance of the site a full-time archeologist must always be available for consultation as well as monitoring. It will be the responsibility of the Ministry of Information and Culture to ensure that the construction process adheres to the agreed to guidelines and regulations.
- Trees will be planted to mask the presence of the road where necessary.

- The contractor will adhere to all of the normal regulations relating to road construction.
- In the construction documents the contractor must be alerted to the possibility of uncovering specific cultural artifacts and the need to treat these artifacts with care and attention.
- The contractor and his senior staff must be trained to recognize artifacts of value. All supervisors must be provided with photographs illustrating examples of artifacts.
- If cultural sites of significance are uncovered there must be an immediate notification to the MCTPC of the discovery and what actions will be taken by the Ministry of Information and Culture. If extensive investigation is to occur there must be contingency funds set aside.

Although there is no awareness of the specific location of any cultural resources of significance on road 16A an archeological field survey must be undertaken prior to the basic design stages to investigate the possible location of cultural resources. The results of this investigation will then be incorporated into the design process.

6.8.4 Socio-Economic Mitigation Measures

(1) Improvement in the Quality of Life and Conditions of Women

It is important that the various health, education and economic development initiatives be designed to ensure an improvement in the quality of life of women and young girls.

Baseline information has to be established to determine the conditions of women prior to construction. This information will allow the monitoring process to determine whether the conditions of women have actually improved due to the investment in road construction.

It is equally important that the women themselves be assisted in dealing with the new opportunities facing them as well as the adverse effects that may come about from the construction and operation of the road. Specific initiatives should be taken to help form women's cooperatives or to design economic development programs that will specifically assist women in taking advantage of the improved access made possible by the new road.

It will be understood that all programs are gender sensitive and inclusive. Gender is seen as a crosscutting theme that must affect all dimensions of the initiatives suggested in this environmental management plan. All officials responsible for the implementation of rules,

plans and regulations must be sensitive to the special concerns and needs of women. Staff should be trained in gender sensitive planning and implementation concerns.

(2) Promotion of Economic Development and Poverty Reduction

One of the national and therefore project goals is to increase income opportunities for local communities thereby helping to reduce poverty. During construction the project could provide opportunities for local people to increase their incomes largely by encouraging the employment of local labor or contracting out various activities. Baseline information has to be established to determine income and employment levels. This information will allow the monitoring process to determine whether economic development and poverty reduction are working.

Once the improved road is in operation there will be opportunities for increased access to markets for agricultural, handicraft and other local products. In order to ensure that these opportunities are achieved it is essential that the government provides support and technical assistance to the communities such as the following initiatives:

- Conducting market research studies to make local people and officials aware of agricultural and handicraft market opportunities.
- Providing access to small loans for establishing small businesses.
- Development of policies that give priority to local people for business development opportunities.

Current policies of the Ministry of Industry and Handicrafts are clearly working in this direction and should be implemented in the subject area. There is no doubt that tourism development at Wat Phou and Ancient City will encourage more economic development of the area after the completion of the road project. To ensure that local people have access to the financial returns from this form of activity public involvement in tourism planning and management and in small business to support tourism activity must be implemented. The economic impact of tourism on the communities and individuals in the area will be monitored. Technical assistance in setting up tourism related small businesses and access to small loans should be provided.

Tourism Development on 14A

The strategies that have already been put forward in the Champasack Heritage Management Plan should be adhered to. It is important however to build upon these strategies since they are only the principles which would form the basis for a comprehensive tourism destination

management plan. The tourism destination management plan must include product development, marketing, organizational and management concerns as well as operational dimensions.

It must also be recognized that the Ancient City and the actual Wat Phou site are not ready for increased tourism numbers. There is a distinct lack of interpretation, site safety is a significant concern, access for older and disabled visitors, basic tourism support services such as a parking lot able to accommodate buses and proper washroom facilities are not available, there is no literature available on the site and there is no guiding system in place. Given the fact that a great deal of the physical fabric has been lost it becomes especially important that a sound interpretation and presentation plan be put into place and implemented before the road is completed. Serious consideration should begin for the development of a virtual reality presentation of the site.

If these issues are not addressed the tourism benefits that could accrue from the construction of the road will not be achieved. Dissatisfied visitors will not help to build a reliable tourism flow and the lack of visitors services will encourage tourists to only stay for a short period of time at the site and then return to Pakse. This is clearly an area where the various authorities must work together in order to ensure that the tourism potential is achieved in a sustainable manner.

It is recommended that all the authorities work together to build upon the principles put forward in the Champasack Heritage Management Plan. Where funding is required there should be a strong case made to donor agencies that these improvements are necessary in order to protect the resource and the community and at the same time achieve the potential economic development.

The levels of tourism and the levels of satisfaction of the tourists and tour operators must be constantly monitored in order to ensure that the necessary mitigation measures can be put into place. Site operators must develop a visitor management plan and monitor its success and failures in order to protect the resource while at the same time enhancing the visitor experience.

How to involve the community in the development of the tourism infrastructure must be the object of collaborative activity amongst several government ministries and other interest groups. Local people will require reliable market information on numbers and types of

tourists and when they will travel to the site, entrepreneurs will require information on how to establish tourism businesses, some will require access to reasonable credit and there will be a distinct need for technical advice as tourism businesses are established. Care must be taken to ensure that local people are given first preference in establishing businesses. Gender sensitive development initiatives must be encouraged in order to ensure that the women in the community have an equal opportunity to share in the potential economic benefits of tourism.

A tourism destination management plan must be developed that includes product development, marketing, organizational and management concerns as well as operational dimensions.

Tourism Development on 16A

The possibility of agro-tourism and eco-tourism development along the road was mentioned on several occasions by both local people and officials. In fact there is already an agreement being signed on an agro tourism project on one of the coffee plantations. A tourism destination management plan must be developed that includes product development, marketing, organizational and management concerns as well as operational dimensions.

If such a plan is not developed and implemented tourism benefits that could accrue from the construction of the road will not be achieved. The levels of tourism and the levels of satisfaction of the tourists and tour operators must be constantly monitored in order to ensure that the necessary mitigation measures can be put into place. Site operators must develop a visitor management plan and monitor its success and failures in order to protect the resource while at the same time enhancing the visitor experience.

How to involve the community in the development of the tourism infrastructure must be the object of collaborative activity among several government ministries and other interest groups. Local people will require reliable market information on numbers and types of tourists and when they will travel to the site, entrepreneurs will require information on how to establish tourism businesses, some will require access to reasonable credit and there will be a distinct need for technical advice as tourism businesses are established. Care must be taken that local people are given first preference in establishing businesses. Gender sensitive development initiatives must be initiated in order to ensure that the women in the community have an equal opportunity to share in the potential economic benefits of tourism.

Caution must also be exercised to protect the community from the negative impacts of

tourism. Residents must be prepared for increased tourism levels and encouraged to maintain their lifestyles and traditions when this is desired. Care must be taken to implement AIDS and sexually transmitted disease awareness and treatment programs.

(3) Promotion of Improved Health Conditions

One of the possible impacts of an improved road is increased access to health services. An all weather surface will ensure that everyone has the possibility of reaching the necessary health facilities which is not the case within the present road conditions. However it is recognized that there are several other issues influencing increased health conditions. Issues of ability to travel to the necessary health facilities, cost of treatments and the language of the health workers are all seen as important ingredients in improving health conditions. It is essential that the Ministry of Health mobilize the necessary resources in order to ensure that the increased road access is matched with improvements in program delivery.

Baseline information has to be established to determine financial and time costs for both residents at the beginning of the road construction process. This information will allow the monitoring process to determine whether health conditions have actually improved due to the investment in road construction.

The following site safety measures during the construction period must be implemented.

- Contractors will be required to submit and obtain approval for health and safety plans prior to commencement of work.
- Careful siting (isolated from local communities) and approved plans and designs for construction and management work camps will be required in order to minimize impacts.
- Safety markings will be set up on temporary roads.
- Effective safety measures should be taken during blasting and blasting should not occur during busy hours.
- Plans for carrying out post construction site clean-ups will be required.
- Adequate drainage should be provided throughout the camps to ensure that stagnant water bodies and puddles do not form.

Programs must be instituted that ensure that everyone in the area of the road be sufficiently alerted to the problems associated with AIDS and STD. In addition, there must be programs in place that help provide assistance in the form of treatments in the case of contracting a sexually transmitted disease and in obtaining birth control assistance.

The program must be funded and will have the following dimensions:

- Strengthening the capacity of provincial AIDS officers
- Services to cure sexually transmitted infection
- Increasing education/public awareness on HIV and AIDS
- Social marketing of condoms

During the operational period there is a possibility of spills of hazardous materials, which could harm the quality of life of local communities. The MCTPC will ensure that the delivery of hazardous substances will require a permit license. Road safety programs and a spill contingency and emergency plan for hazardous and toxic materials will be put in place.

To avoid any impacts from UXO all necessary measures must be taken to clear the construction areas of unexploded ordinances.

(4) Increased Access to Educational Opportunities

One of the major complaints about present road conditions is that it is very difficult or at times impossible for children to travel to school during the rainy season. The improved road will certainly provide for an all weather surface thereby facilitating travel. As in the case of health there are a number of other essential ingredients to increasing access to educational opportunities. Issues such as cost, the need to employ children in agricultural activities and the perceived benefits of education must be addressed. The Ministry of Education must work to ensure that the constraints that presently exist are minimized in order to take advantage of the increased access provided by the improved road.

Baseline information has to be established to determine educational levels of residents at the beginning of the road construction process. This information will allow the monitoring process to accurately measure the impact of the road on educational issues.

(5) Better Access to Government Services

The improved road will very much facilitate the movement of residents to various government offices. There are clearly constraints to accessing offices having to do with levels of mobility. Collecting baseline information will allow for an assessment of whether there actually has been increased access to government services given the new road.

(6) Protection of Traditional Ways of Life

In order to ensure that traditional ways of life are protected the project should fund studies asking communities to identify what is socially and culturally important for them to protect and then use this information as baseline data in ongoing monitoring. Government officials will then work with communities to evaluate if the changes occurring in the communities meet with community expectations and standards. In the case of unexpected negative changes communities will be helped in developing strategies for countering these negative impacts.

In the case of unexpected negative changes communities will be helped in developing strategies for countering these negative consequences.

(7) Access for People on the Old Road Section

Due to the proposed new road alignment in section 3 of road 14A and the proposed shortcut in section 2 of road 16A, people who are left behind should be provided with the opportunity to move to either the newly constructed road or connect to the new road. It is essential that an all weather link be provided for the community to the new road. This link does not necessarily have to be built to national road standards but must provide for all weather access.

6.9 Development of Environmental Management Plan (EMP)

The environmental management plan is designed to minimize the negative impacts and to ensure that the full benefits of the road will be realized in order to increase the quality of life of the residents. The environmental management plan is divided into two parts.

- Plan, Policies and Regulations discussed earlier.
- Monitoring and Remediation Plan, which will be discussed in this section.

According to the Regulation on Environment Assessment in the Lao PDR prepared by STEA 2002, an environment management plan must contain:

- Protective or reductive measures for environmental impacts.
- Compensation measures (if any).
- Institutional arrangements, timing and budgets for implementation of EMP.
- An environmental monitoring program.
- Community preparation including dissemination of information about the Project prior to work commencing.

The IEE for Roads 14A and 16A have been developed to incorporate these factors.

The nature of the environmental management planning process adopted in the IEE process can be seen in Figure 6.9.1.

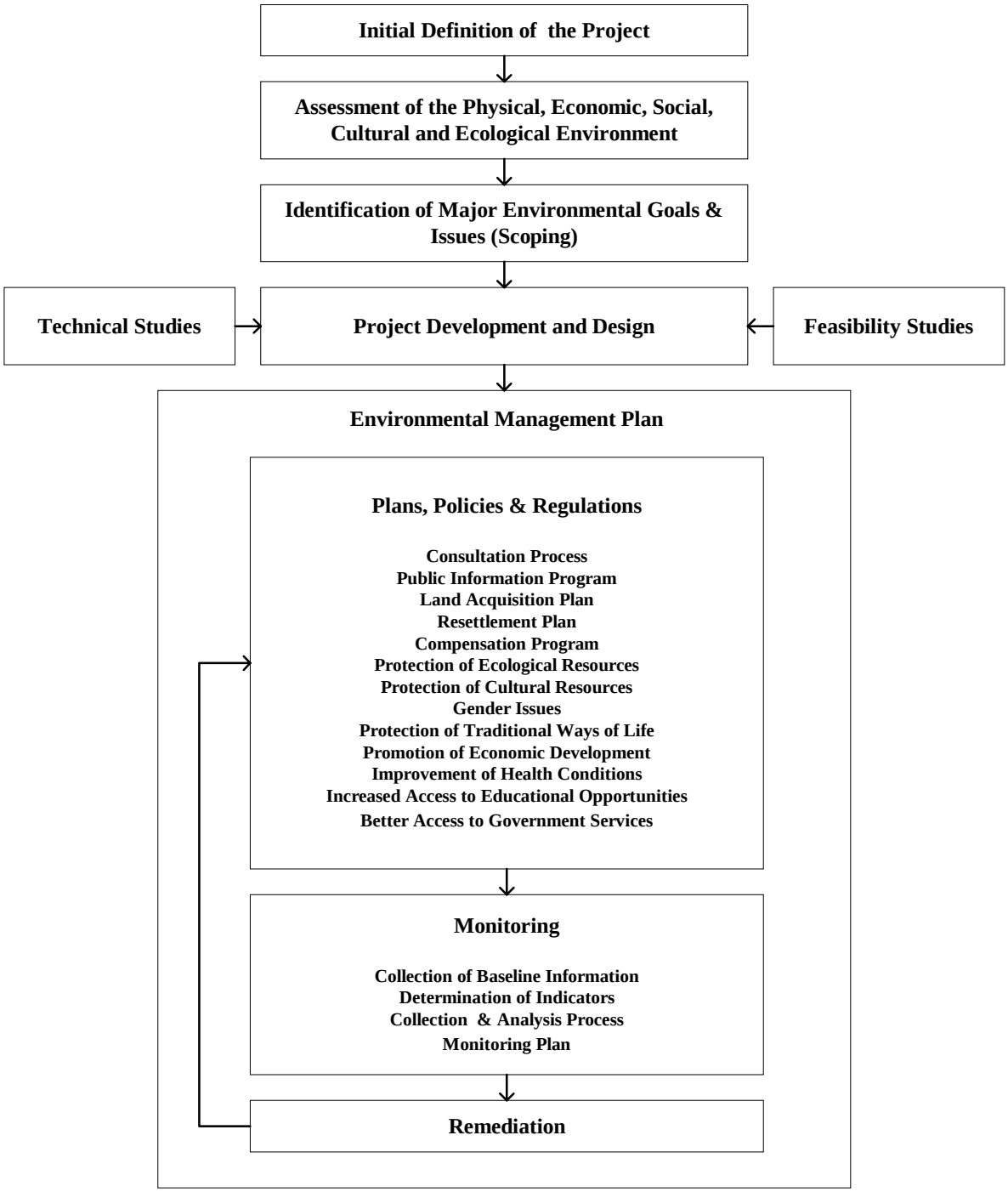

Figure 6.9.1 Environmental Assessment Process

This environmental management plan is designed to deal with the potential negative impacts identified in the assessment process and to maximize the benefits from the positive results of the road construction and operation. It is assumed that the plans, policies and regulations suggested in this IEE are implemented and monitored in order to ensure that the road has the desired beneficial impact and does not negatively affect any of the important environmental dimensions discussed earlier.

As will be seen the implementation of the plans and policies depends on the participation and cooperation of various government ministries and agencies. It is clear that the Department of Roads, MCTPC, neither has the resources nor the expertise to ensure that the full benefits of the construction are achieved and that the negative dimensions are dealt with as part of the design, construction and operational phases. The implementation of the plans and policies and the necessary monitoring must be done in a cooperative matter with MCTPC playing an essential coordinating and integrative role.

6.9.1 Monitoring Plan

Article 15 of the Regulation on Environment Assessment in the Lao PDR of the Science Technology and Environment Agency specifies that the project owner is directly responsible for the monitoring and evaluation of the project environment during the implementation of the EMP. Reports on project environmental monitoring must be produced monthly and sent to the concerned agencies, which are STEA, Provincial, Municipal or Special Zone Science and the Environment Management and Monitoring Units of the concerned line ministries for information and supervision.

(1) Collection of Baseline Information

Given the shifting nature of the population and other conditions in the region of the road it is recommended that just prior to the construction process beginning that a complete baseline study be undertaken to collect the necessary data on the indicators that have been identified by the various stakeholders. In some cases this baseline information can be collected by the various ministries and departments in a reliable and professional manner. It is important to ensure that the information collected is accurate since it will form the basis for the monitoring process. Funding should be available by the road construction program to collect this information.

(2) The Determination of Indicators

The indicators that have been identified are chosen to accomplish the objective of measuring the negative and positive impacts of the road construction as well as being feasible in terms of their collection and analysis. It must be recognized that there are resource and capacity constraints that will very much affect the ability of the various government ministries and departments to collect information. It is important that the indicators be seen as helping to understand overall impacts and not be seen as only considering one portion of a particular environmental issue. For example the number of children attending school will be important to be aware of but also this figure will be seen as an indicator of the overall success of the road in helping to encourage higher levels of enrollments in schools. It is important that the indicators be seriously considered and that may be amended if this is seen as desirable once the monitoring process takes place.

(3) Collection & Analysis Process

As has been mentioned there are clear resources capacity constraints within the present government system as it relates to monitoring. Therefore if the monitoring program is to be successful financial resources must be allocated to the process and the capacities of the various actors must be developed. It is recommended that the overall funds allocated to the road construction incorporate financial resources for the monitoring process. The monitoring program that is presented identifies financial and capacity issues and it is seen that these considerations are essential in ensuring a successful assessment of the impact of the road from the perspective of the many dimensions considered in this IEE. Figure 6.9.2 illustrates the monitoring and remediation process.

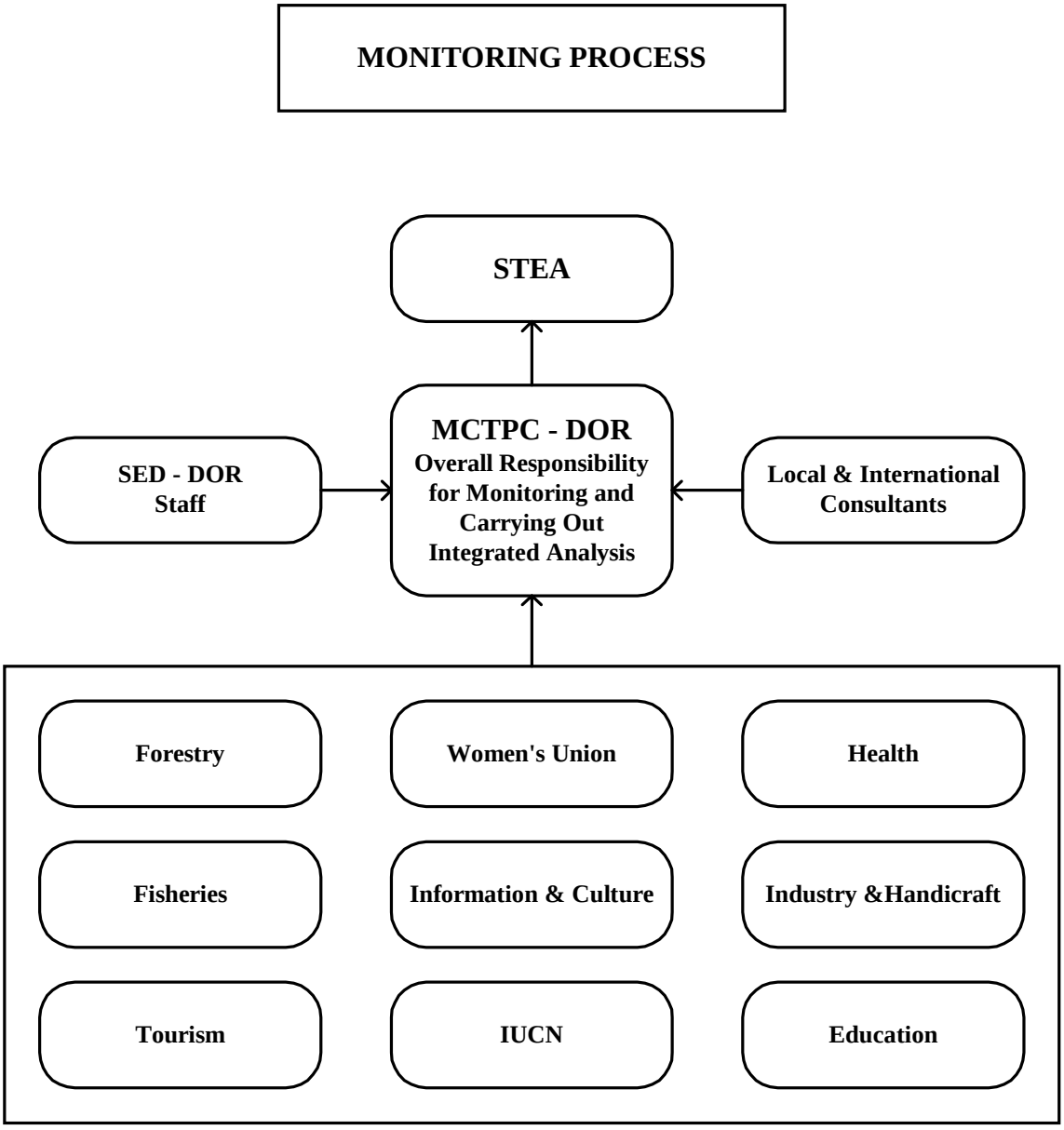

Figure 6.9.2 Monitoring Process

The analysis process must be seen as more than one that collects the information and reports it. The various government departments and ministries must analyze the information in order to better understand the impact of the road. It may be that negative or positive impacts that are occurring are not directly related to the road construction but as a result of advances and programs within the national, provincial and district environment. For example, it may be that an increased enrollment of children in schools could be attributable in large part to the construction of schools and the allocation of funding to subsidize the very poor to attend the schools. There must be caution always exercised that the results of the monitoring process are

always carefully analyzed in order to accurately assess the impact of the road construction and operation. This will require capacity building and sophistication in dealing with the data generated by the monitoring process.

The Department of Roads will then be faced with the task of bringing together the various indicators that have been collected and analyzed and reported to STEA as well as the donors about the impact of the road. It is important that the monitoring process also be seen as a learning exercise where lessons derived from the experience are incorporated into other design and construction activities.

6.9.2 Monitoring Program

(1) Pre Construction

Issues	Monitoring			
	Institutional Responsibility	**Factor(s) to Be Measured**	**Means of Validation**	**Collection & Reporting Time Scale**
Public consultation program during the preconstruction process.	MCTPC	■ Adherence to consultation program schedules and activities	Assessment of actual activities	Bi-Monthly
Public information program	MCTPC	■ Adherence to public information program schedules and activities	Assessment of actual activities	Bi-Monthly
Land Acquisition Plan	MCTPC	■ The quality of life of affected people as measured by income levels and cost of living after the land acquisition plan is put into place	Survey of affected people's conditions according to baseline studies	Bi-Monthly
Resettlement Plan	MCTPC	■ Quality of life of affected people after resettlement as measured by income levels and cost of living	Survey of affected people's conditions according to baseline studies	Monthly during resettlement process and yearly after completion of the project
Compensation	MCTPC	■ Whether the terms and conditions of compensation plan are adhered to.	Assessment of actual allocations	Every three months during the compensation process.

(2) Construction

Impacts/Issues	Monitoring			
	Institutional Responsibility	**Factor(s) to be Measured**	**Means of Validation**	**Collection & Reporting Time Scale**
Dust	MCTPC	■ Dust levels at adjacent buildings	Visual testing at designated sites	Monthly
Noise pollution	MCTPC	■ Adherence to designated working hours ■ Possible testing of noise levels at sensitive locations	Site monitoring Testing by instruments	Monthly
River water quality at plants & worker camps	MCTPC	■ Water quality as measured by national standards	Water quality measurement tests at key sites	Monthly
River water quality at bridge construction sites	MCTPC	■ Water quality as measured by national standards	Water quality measurement tests at key sites	Monthly
Erosion	MCTPC Ministry of Agriculture & Forestry	■ Erosion levels	Site inspection	Every 2 weeks
Traffic safety	MCTPC Provincial Government	■ Number of accidents compared to national levels	Statistical survey	Monthly
Visual impacts	MCTPC	■ Cleanliness of road and construction areas	Site inspections	Monthly
Loss or damage to forest resources	MCTPC Ministry of Agriculture and Forestry	■ Unplanned loss of forest resources	Site inspections	Monthly
Negative changes in the health and migratory patterns of fish species	MCTPC Ministry of Agriculture and Forestry	■ Changes in migration patterns and fish yields	Studies based on baseline studies at key sites	Monthly
Loss or damage of cultural resources	MCTPC Contractor Ministry of Information and Culture	■ Condition of cultural relics	Site inspections	Ongoing monitoring and monthly reporting
Economic development	MCTPC	■ Income levels of local people	Statistical reviews	Bimonthly
AIDS and STD	MCTPC Ministry of Health	■ AIDS & STD occurrences in residents	Surveys based on baseline studies	Bimonthly

(3) Operations

Impacts/Issues	Monitoring			
	Institutional Responsibility	**Factor(s) to be Measured**	**Means of Validation**	**Collection & Reporting Time Scale**
Air quality	MCTPC	■ Air quality levels at sensitive areas assessed by national standards	Air quality instrument Measurement at key sites	Yearly
Noise Pollution	MCTPC	■ Noise level at school and residential areas assessed by national standards	Noise instrument measurement at key sites	Yearly
Water quality at river sites	MCTPC	■ Water quality as measured by national standards	Water quality measurement tests	Monthly
Physical impacts from future development on community on road section 3, Champasack Town	MCTPC Ministry of Information and Culture	■ Changes on cultural landscape ■ Changes in housing style	Survey	Reporting yearly
Gender	MCTPC Women' Union	■ Income levels ■ Educational levels ■ Basic health levels	Survey	Yearly
Economic development/poverty reduction	MCTPC	■ Income levels ■ Income levels as compared to national levels	Survey based on baseline studies	Yearly
Impacts on community daily life and business from the proposed bypass at Ban Dontalat on road section 6	MCTPC	■ Change in income levels	Survey	Yearly
Impacts of tourism development on Vat Phou and Ancient City	Ministry of Information and Culture	■ Changes in physical and environmental conditions of the area ■ Revenue/funds generated from tourism development ■ Income distribution of from tourism to local people	Survey & research studies	Yearly
Impacts of eco tourism development	Ministry of Agriculture and Forestry	■ Changes in physical and environmental conditions of the area ■ Revenue/funds generated from eco tourism development ■ Income distribution of from tourism to local people	Survey & research studies	Yearly

Impacts/Issues	Monitoring			
	Institutional Responsibility	Factor(s) to be Measured	Means of Validation	Collection & Reporting Time Scale
Increase in health conditions	MCTPC Ministry of Health	■ Basic health levels as measured by WHO ■ Health levels as compared to national levels	Survey based on baseline studies	Yearly
Increase in educational levels	MCTPC Ministry of Education	■ School enrollments ■ School enrollments as compared to national levels	Survey based on baseline studies	Yearly
Increased access to social services	MCTPC Provincial Government	■ Average travel times and costs ■ Average travel times and costs compared to national levels	Survey based on baseline studies	Yearly
Cultural impacts on local people	MCTPC	■ Changes in traditional ways of life as measured by baseline study	Survey	Yearly
Access of people on old road section	MCTPC	■ Length of travel times for various activities	Survey based on baseline study	Yearly

6.9.3 Remediation Process

While it is important to monitor positive and negative impacts for purposes of reporting to various ministries, donor agencies and STEA it must be remembered that monitoring is essentially carried out in order to ensure that any unexpected negative impacts are dealt with. It is also designed to ensure that if the hoped for positive impacts are not occurring that there can be changes implemented to the various plans, programs and approaches. It is vital therefore that the various ministries and departments as well as the Department of Roads use the information generated by the monitoring process to re-examine various dimensions of the environmental management plan as well as the design and construction standards and regulations in order to ensure that the desired impacts are being achieved.

This will require at times a multi-stakeholder approach where various programs may have to be put into place in order to ensure the overall success of the road construction project. An example would be that if the number of children enrolling in schools does not increase that there is a serious examination to determine why. It may be that the reasons have nothing to do with the road but have to do with subsidy programs or public attitudes related to education. If the government is sincere in wanting to raise educational levels and to take advantage of the improved access provided by the road then that these government programs will have to be

altered at times to achieve the hoped for benefits.

6.9.4 Capacity Building

To effectively prevent the negative impacts and ensure the benefits from the road improvement project, there will be a need for a capacity building program for all levels of government. For government officials varying levels of capacity building in the following areas will be required recognizing the reality that the capacity building will be different for each ministry and agency:

- Overall environmental assessment ideas and procedures.
- Establishing and carrying out a baseline data program.
- Conducting the collection of indicator data.
- Analyzing and reporting the results of this collection process.
- Integrating the data to develop an overall perspective of the road impacts.
- Developing expertise in remediation processes.

The capacity building will in large part be hands-on and it is recommended that there will be a need for significant on the job training as opposed to formal classroom sessions.

6.10 Application for Environmental Certificate

The environmental examination for the Project has been thorough and conducted in close consultation with the MCTPC and other relevant stakeholders. Overall environmental impacts from construction of both roads 14A and 16A are assessed as minor because:

- The project significantly increases the access of residents to markets for their produce as well as a range of social services (especially schools and hospitals).
- The residents in the road 14A section without a road will have access where none has existed. This increased access must be seen as a major positive impact for the residents.
- The project provides additional protection for heritage resources with the moving of the road away from the ancient city.
- Increased access to Wat Phou, if properly managed, will generate additional income possibilities to local people.
- Increased access to the Se Katam Tok Waterfall, if properly managed, will generate additional income possibilities for local people on road 16A.
- Given that the natural/ecological environment is not of national significance there are

little or no negative impacts on the ecological system of the area.

- Provisions have been made to mitigate whatever negative impacts through compensation as well as government programs.
- The project has recognized that there are significant benefits than can accrue from the road construction and improvement if mitigation measures and programs are put into place in the help realize the potential of the significant investment that will be provided to improve Road 16A.

The IEE concludes that the overall adverse impacts of the Project will be minor. Careful consideration has been given to Project location, design, construction and operational issues to minimize impacts on environmentally sensitive areas. Compensation procedures and mitigation actions have been identified.

The Project is at the stage where the two IEE reports are in the hands of the Department of Road of MCTPC, which they will have to submit the IEE reports for STEA approval on environmental certificate.