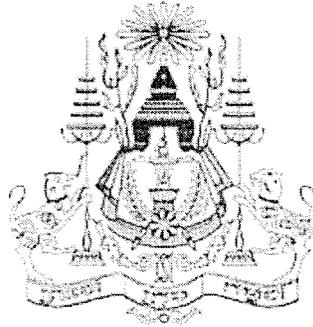


Kingdom of Cambodia



**Provincial and Rural Infrastructure Project (PRIP)
World Bank (KH-P071207)**

**Environmental Assessment
and
Environmental Management Plan**

**Ministry of Public Works and Transport and
Ministry of Rural Development**

March 9, 2003

INTRODUCTION AND EXECUTIVE SUMMARY

1.1 Project Description

The Provincial and Rural Infrastructure Project (PRIP) is a 5-year project designed to rehabilitate and maintain a number of selected national-secondary, provincial and tertiary rural roads along their present alignments in four provinces north of Tonle Sap in the Kingdom of Cambodia, namely, the provinces of Siem Reap, Odtar Mean Chey, Preah Vihear and Kampong Thom. The project area and roads selected for rehabilitation in the PRIP Year-1 program are shown on **Exhibit 1**.

The long-range goal of this project is poverty alleviation. The type and magnitude of planned works varies by road section. Works include upgrading and paving existing dirt roads, rehabilitation and expansion of paved embankments, the repair or replacement of damaged or under-strength bridges and culverts, and periodic and routine maintenance.

This Environmental Assessment (EA) has been prepared to ensure that the project is environmentally sound and sustainable, to ensure that environmental consequences of the project are understood, and to identify ways to prevent, minimize or mitigate adverse effects.

The EA is based upon the review of available documents, field inspections of the environmental characteristics (including social and cultural characteristics) of areas around and through which the roads pass, inspections of the road sections to be rehabilitated and consideration of the construction methods and quantities that would be involved.

Purpose of Environmental Assessment (EA)

The first purpose of the EA was to determine the characteristics of the existing bio-physical and built environments that may be impacted by the PRIP. The second purpose was to provide the basis for the preparation of the Environmental Management Plan (EMP) to prevent or mitigate potential negative impacts caused by the project.

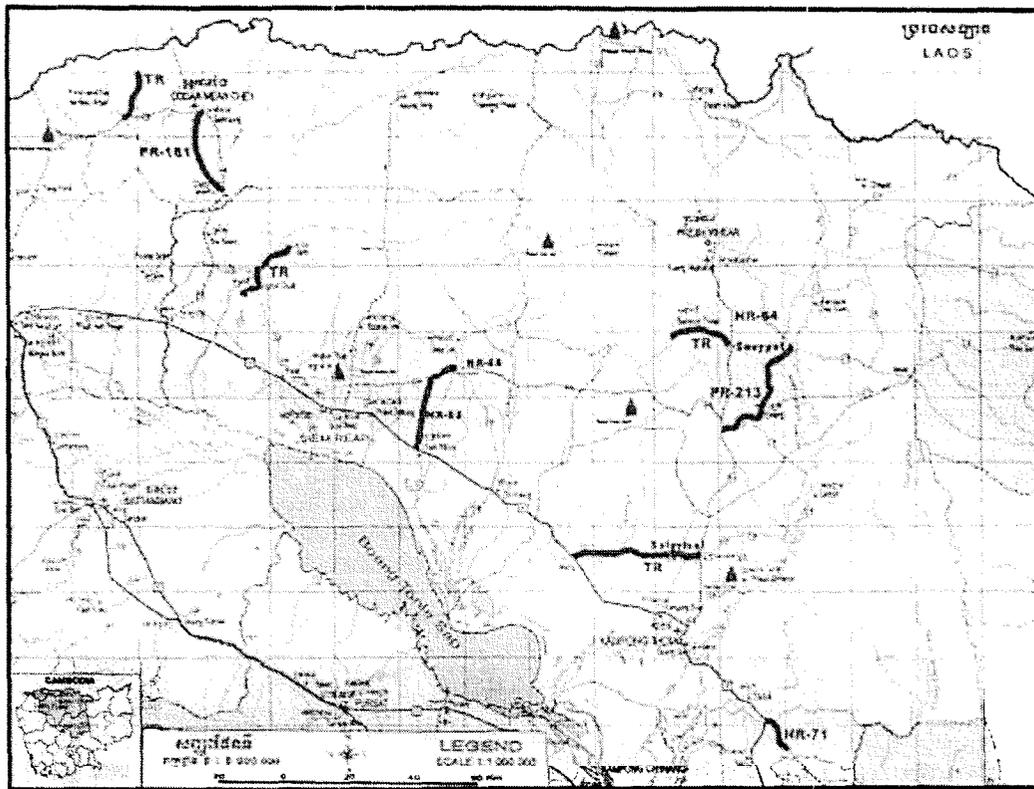
The specific objectives of the environmental assessment (EA) are to:

- Describe and assess the existing environments that would be affected or impacted by the proposed road rehabilitation and maintenance project;
- Identify and assess the types and magnitude of potential environmental impacts and identify particular issues or important areas of impact requiring additional, in-depth assessment;
- Identify and describe measures to prevent or mitigate potential environmental impacts; and
- Prepare an Environmental Management Plan (EMP) of appropriate actions to be taken and a monitoring program to ensure compliance with the plan.

Project Description

The PRIP is designed to rehabilitate 300 to 400km of existing national secondary (2-digit roads), provincial (3-digit roads), and tertiary-1 roads along their present alignments by raising, strengthening and widening the embankments and re-building them as necessary, building/replacing bridges and culverts as required to ensure all-season road access, and providing periodic and routine maintenance of maintainable roads in the PRIP area.

Exhibit 1: Project Area and Year-1 Roads for Rehabilitation (as of 06/02/03)



Existing bridges and culverts along several road sections have been recently upgraded under Cambodia's Social Fund but many sections of road, bridges and culverts are deteriorated or lacking (e.g., along tertiary roads).

Project roads, to be rehabilitated along their present alignments, will be 5-8m wide, with shoulders of 50cm-100cm, constructed on earth/laterite embankments sufficiently high (in most cases about 50cm higher than the present grade) to clear the 10-year flood level.

For most road sections, embankment construction material will be obtained from borrow pits alongside the existing roads. These will be finished after materials extraction as wide ditches to drain the completed road or as ponds to retain water for local use and aquaculture.

Information on the planned works program and selected road sections is summarized in **Exhibit 2**. Examples of the road cross-sections designed by the International Labour Organization (ILO) are shown in **ANNEX A**.

Exhibit 2: Summary Information on Roads for Rehabilitation in PRIP Year-1

Road Section	Approx Length (km)	Works Summary- using LBAT Construction Techniques		Approx Cost (US \$m)
Siem Reap				
NR-65 Sotr Nikum NR-6/NR-66	22	Road width 8m Double-coat bitumen seal	25cm gravel base course 44,000 cu.m. gravel	1.9
NR-66 NR-65/B Mealia	9	Road width 8m Double-coat bitumen seal	25cm gravel base course 18,000 cu.m. gravel	1.0
Varin/A. Chum <i>Tertiary road</i>	21	Road width 5.25m Single-coat bitumen seal	20cm gravel base course 22,000 cu.m. gravel	0.5
Kampong Thom				
NR-71 K. Thmor/K. Cham border	15	Road width 8m Double-coat bitumen seal	25cm gravel base course 30,000 cu.m. gravel	1.2
Stoung NR-6/Sala Visai NR-64 <i>Tertiary road</i>	21 (west section)	Road width 5.25m Single-coat bitumen seal	20cm gravel base course 28,000 cu.m. gravel	0.9
Oddar Meanchey				
PR-181 Samrong/Changkal districts	12 (north section)	Road width 8m Single-coat bitumen seal	25cm gravel base course 36,000 cu.m. gravel	1.6
Kouk Mon, NR-56/PR-183 <i>Tertiary road</i>	12	Road width 5.25m Single-coat bitumen seal	20cm gravel base course 13,000 cu.m. gravel	0.2
Preah Vihear				
PR-213 Phnom Deik NR-64/Rik Reav commune	24	Road width 8m Single-coat bitumen seal	25cm gravel base course 40,000 cu.m. gravel	2.7
Svaypat NR-64/Sdao <i>Tertiary road</i>	24	Road width 5.25m Single-coat bitumen seal	20cm gravel base course 25,000 cu.m. gravel	0.5
Total (approximate)	160km	--	--	10.5

- Notes:
1. Data as of 06/02/03.
 2. Several road sections are expected to take more than 1-year to complete.
 3. Unless shown otherwise, no route passes through or close to an important wetland, forest area, river, or archaeological site.
 4. Costs provided by ILO are stated to be indicative only.
 5. Construction will be similar on all roads. Differences lie in the number of bitumen coats, the gravel base course and the road width. Roads will have laterite or clay base overlain by gravel compacted by vibrating compactor. Bitumen will be heated in-situ and applied to all roads, 2-coats for NR. Borrow pits, located immediately adjacent to the roads, and within the ROW, will be converted to ponds or wide drainage ditches after extraction. Gravel will be transported by truck from quarries near each road section. Embankment material and gravel will be spread by hand.

1.4 Rights of Way

Right-of-Way (ROW) in the Kingdom of Cambodia is governed by the Prime Ministerial Edict: Measures to Eliminate Anarchical Land Grabbing (1999), declaring public land on the verge of roads that must not be occupied per the ROW determined for each type of road. National-secondary roads rights-of-way are 50m, 25m from either side of the road centerline. The provincial road ROW is 40m, 20m from either side of the road centerline, and for commune roads, the ROW is 30m, 15m from the center line. These restrictions are not applicable in towns.

PRIP involves the rehabilitation and maintenance of existing national-secondary, provincial and commune level roads with their different legal rights-of-way. However, Cambodian practice is to "take" a "clear zone" considerably less in width than the legal ROW. For PRIP national-secondary and provincial roads a clear zone of 10m will be sufficient; for tertiary roads 8m will be sufficient.

Where land in the ROW clear zone is used for farming or contains fruit-bearing trees, residences, commercial buildings, or other structures that would need to be removed, compensation will be awarded to users and owners according to the Ministry of Public Works and Transport (MPWT) and the Ministry of Rural Development (MRD) policies on Involuntary Resettlement (see APPENDIX 8 to *Project Implementation Plan*). But no resettlement is required to make way for PRIP Year-1 road works and none is expected in future years.

1.5 Environmental Setting in Brief

The climate in the area of impact is dry monsoon with a 7-8 month dry period. The wet season, from about July through October brings extensive flooding.

The entire project area is part of a large shallow basin extending from the Thailand border to the Mekong River. With the exceptions of riverbanks and slightly incised rivers, the PRIP area is essentially flat land sloping gently towards Tonle Sap Lake. There are many areas of sandy soil, particularly in the north. In these zones, the soil has low water and soil nutrient retention capacity, consequently, land productivity is limited and the population density is very low. In areas of loam soil, productivity and population density is relatively high but these areas are confined to lenses of loam in shallow basins and in areas near Tonle Sap lake.

There are two important wildlife reserves and one national park within the four PRIP provinces as follows (see **Exhibit 3**):

Phnom Kulen National Park: This park, within the Siem River watershed, is a wildlife reserve as well as an important archaeological site.

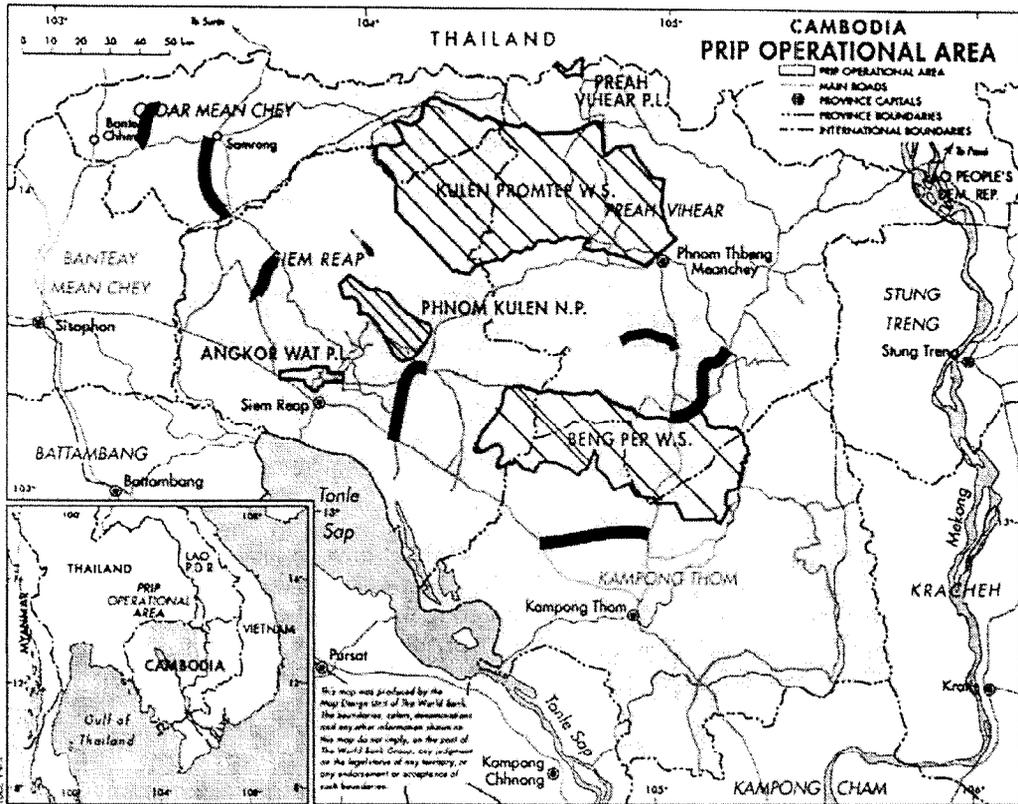
Kulen Promtep Wildlife Sanctuary: This park, the largest protected area in Cambodia (402,500 ha), was set aside to protect the Kouprey, an extensive area of lowland forest and the largest swamp in the country.

Boeng Per Wildlife Sanctuary: This has been a wildlife sanctuary for some time. The 242,500 ha provide habitat for populations of wild cattle and deer, large water birds (that migrate to Tonle Sap) and herds of elephants. There are also a number of important archaeological sites.

Exhibit 3 shows that one of the roads – PR-213 – abuts Boeng Per National Wildlife Sanctuary along about 7km of its northern boundary.

No undisturbed forest remains in the area served by PRIP roads. It was under Khmer Rouge control until 1997 and has been logged of valuable trees over the past two decades.

Exhibit 3: Reserves and PRIP Roads for Rehabilitation – Year 1 (as of 06/02/03)



1.6 Land Acquisition, Involuntary Resettlement and Indigenous Peoples along Roads for Rehabilitation in PRIP Year-1

No land acquisition, involuntary resettlement or acquisition of other assets will be necessary to make way for road rehabilitation in the PRIP Year-1 program. No community will be affected except by nuisance associated with short-term construction impacts.

Srae Thnong village located on PR-213, a road in Preah Vihear Province, and selected for rehabilitation in the PRIP Year-1 Program, is a community of 65 households, 61 being of the Kuoy indigenous group. The people of this village are integrated into main-stream Cambodian culture and will not suffer any impact by type or magnitude different from that affecting other communities. Impacts on this community, and all communities affected by the PRIP, will be minor and confined to short-term nuisance. However, in order to address specific Indigenous Peoples issues, an Indigenous Peoples Development Plan will be prepared for Srae Thnong (also see PRIP *Social Assessment*).

1.7 Summary of Likely Impacts

Negative environmental impacts will relate principally to construction activities. Impacts include those resulting from short-term: construction traffic, dust, noise and other nuisance, potential erosion and damage to small ponds and wetlands.

Long-term negative impacts will be confined to those arising from increased traffic and travel speeds along the roads and the potential for damage to a national reserve due to the improved access provided by PR-213 selected for rehabilitation in Year-1. The road abuts about 7km of the northern boundary of Beng Per Wildlife Sanctuary. The existing road is wide and graveled. The proposed treatment will upgrade the base of the road, bituminize its surface and improve drainage and culverts along the same alignment as the existing road.

Positive socio-economic impacts will include reduced travel time and cost; improved year-round access to health and education facilities, services, cultural activities, markets and employment opportunities; short-term jobs created during the construction period; improved access to heritage sites (to improve tourism income generation); and improved flood control through the drainage facilities to be installed as part of road design.

To enhance the local environments, the project includes requirements and funding for tree planting along the completed road corridors.

When roads have been rehabilitated, cars and 4-wheel drive vehicles used by Police and other Government authorities, as well as NGOs, will have easier and faster, year-round access to areas served by PRIP roads (compared to the current easy access only by heavy trucks). Consequently, the rehabilitated roads under PRIP will enable improvement of management of reserves and wildlife, and improved levels of social and health services.

1.8 Impact Mitigation

The Environmental Management Plan (EMP – **ANNEX B**) includes measures to address all potential impacts and will be included in the Contract Specifications.

Potential environmental and safety impacts are readily avoidable and can be easily mitigated, for example, by adopting good engineering practices and, in the case of PR-213, by controlling access to national parks and reserves.

As PRIP will be a 5-Year project and as this EA only addresses potential impacts that may be created during PRIP Year-1, guidelines have been prepared on environmental assessment in subsequent years of PRIP, when candidate roads are considered for inclusion in annual works programs. The Guidelines are included in **ANNEX B**.

Impact mitigation measures identified within this EA relate to the impacts identified above and to the need for the management of travel speed, truck axle loadings, and the dissemination of road safety information to villages located along the alignments.

Labour Based Assisted Technology (LBAT) construction techniques will be employed on all PRIP road sections. Because LBAT techniques are based on use human labour rather than heavy equipment, many of the impacts normally caused by road rehabilitation activities will be insignificant compared those caused by mechanized construction methods. For example, the noise, dust, air pollution and traffic problems created by many thousands of truck movements transporting earthworks materials will be eliminated. The use of graders will be very much reduced because material will be spread by hand. Borrow pits dug by hand and alongside roads, will be shallow and easy to stabilize or make into ponds.

LBAT construction techniques will however employ many people. This has not only positive (income-related) effects but also negative effects. The volumes of human sewage and domestic waste being the principal concerns. Sewage will therefore be handled via the construction/use of latrines located at suitable places adjacent to worksites. Food waste will be deposited in containers and disposed of daily to a latrine or a landfill site constructed and maintained by contractors, as will other solid waste.

Other 'normal' negative environmental impacts related to road rehabilitation will be addressed through implementing standard impact prevention or mitigation measures, for example, by adopting normal engineering practices, to ensure that:

- Adequate temporary and permanent drainage is constructed;
- The faces of embankments and waste materials piles become stabilized and planted to prevent erosion;
- Borrow pits are similarly stabilized or finished to become fish-ponds or wide drainage ditches; and
- Tree planting and landscaping and the design treatment of bridges, enhance the road-scapes and increase the benefits accruing from the project.

Environmental impact prevention and mitigation measures are identified in the Environmental Management Plan (EMP) including Specifications to be part of each Contract package (see **ANNEX B** to this report).

1.9 Conclusions and Recommendations

The existing or baseline environment and potential project-caused environmental impacts have been identified for all road sections included in the Year-1 Annual Works Program. These are typical and well understood.

Involuntary resettlement is not required for PRIP Year-1 road works and not expected to become a major issue in subsequent years.

Recommended steps to ensure that the EMP is implemented are as follows:

1. To ensure that contractors pay attention to environmental impact mitigation, the EMP will be included in the Specifications to be part of the Contract Package.
2. To ensure that contractors understand the actions to be taken and the cost implications of environmental management, and to ensure that required actions and measures are priced in bid proposals, short-listed contractors shall be informed of the EMP at the Pre-Bid Meetings.
3. Soon after their appointment, contractors, as well as MPWT/MRD supervisors and project personnel will attend a seminar on environmental management explaining impact prevention/mitigation, the EMP included in their contracts, and the environmental management monitoring to be implemented.
4. To ensure compliance with the EMP, 10% should be held back from the final payment until site inspection determines that environmental management has been adequate.
5. The Supervising Engineer is to report monthly on Contractor performance and progress with regard to compliance with the EMP (as a section in the regular Monthly Reports).