

# Initial Environmental Examination

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August 2014

## Cambodia: Flood Damage Emergency Reconstruction Project-Additional Financing

Prepared by Ministry of Public Works and Transport for the Asian Development Bank.

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**MINISTRY OF PUBLIC WORKS AND TRANSPORT**

**ASIAN DEVELOPMENT BANK**

**Cambodia:**  
**Flood Damage Emergency Reconstruction Project –**  
**Additional Financing (FDERP-AF)**

**CW13: Emergency Reconstruction of Laterite Road (18.75 km) at PR**  
**No. 1570 in Battambang Province**

**INITIAL ENVIRONMENTAL EXAMINATION**  
**REPORT**

**Ministry of Public Works and Transport**

**Phnom Penh, August 2014**

## ABBREVIATIONS

ADB	Asian Development Bank
APs	Affected Persons
BOD	Biological Oxygen Demand
CTDP	Corridor Towns Development Project
CW	Civil Work
DBST	Double Bituminous Surface Treatment
DDIS	Detailed Design and Implementation Supervision
DoE	Department of Environment
EA	Executing Agency
EARF	Environmental Assessment and Review Framework
EIA	Environmental Impact Assessment
EMoP	Environmental Monitoring Plan
EMP	Environmental Management Plan
FDERP-AF	Flood Damage Emergency Reconstruction Project – Additional Financing
FS	Feasibility Study
GMS	Greater Mekong Sub-region
GoC	Government of Cambodia
GPS	Global Positioning System
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
ha	Hectare
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
IA	Implementing Agency
IBA	Important Bird Area
IEE	Initial Environmental Examination
IEIA	Initial Environmental Impact Assessment
IUCN	International Union for Conservation of Nature
JICA	Japan International Cooperation Agency
MEF	Ministry of Economy and Finance
MOE	Ministry of Environment
MOWRAM	Ministry of Water Resources and Meteorology
MPWT	Ministry of Public Works and Transport
MRD	Ministry of Rural Development
NGO	None Government Organization

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NR	National Road
NTFP	Non-Timber Forest Products
O&M	Operation and Maintenance
PAs	Protect Areas
PCMU	Project Coordination and Monitoring Unit
PDPWT	Provincial Department of Public Works and Transport
PDRD	Provincial Department of Rural Development
PIU	Project Implementation Unit
PPTA	Project Preparation TA
PR	Provincial Road
REA	Rapid Environmental Assessment
RGC	Royal Government of Cambodia
RI	Riel
ROW	Right of Way
RP	Resettlement Plan
SEIA	Summary Environmental Impact Assessment
SEU	Social and Environmental Unit
SPS	ADB's Safeguard Policy Statement (2009)
SS	Suspend Solid
TA	Technical Assistance
TSP	Total Suspended Particulates
USD	United States Dollar
UXO	Unexploded Ordnance
WB	World Bank

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## I. EXECUTIVE SUMMARY

1. The Asian Development Bank (ADB) and the Royal Government of Cambodia (RGC) agreed to implement the Flood Damage Emergency Reconstruction Project –Additional Financing (FDERP-AF), with the funding through a loan from the ADB and grant from the Australian Government (Department of Foreign Affairs and Trade). The project which was divided into three (3) Outputs aims to restore and reestablish the use of flood-damaged infrastructures. Among those outputs, output 1 is the rehabilitation of the national and provincial roads including some bridges which will be implemented by the Ministry of Public Works and Transport (MPWT).
2. Under Stage 3 Subprojects of FDERP-AF/MPWT Output 1 have been classified as Category "B" based on ADB's project categorization scheme, hence, preparation of Initial Environmental Examination (IEE) Report is required. This report covers the CW13 subproject of Laterite road 18.75 km (PR No. 1570) located in Battambang province.
3. A review of project-related reports, gathering of secondary data, site inspection and public meeting with local people have been undertaken. Expected impacts and corresponding mitigation measures have been identified. The assessment includes verification if any supplementary study is required.
4. Some of the negative impacts expected are dust, noise, air quality, surface water quality, hazards, including generation of solid wastes and wastewater. These impacts are short term and deemed insignificant when monitored and managed with timely and efficient implementation of mitigation measures in the environmental management plan (EMP).
5. During operation phase, implementation of the project is expected to deliver significant social benefits. Of the expected advantages that can be realized by beneficiaries of the project, this will include reduced risk to life and property caused by floods, an improvement to livelihood, largely because of reduced travel time and associated costs. The temporary nuisance caused by emergency reconstruction of the Laterite road 18.75 km will be minimized through agreed and monitored mitigation measures, in consultation with the local community and key stakeholders.
6. Some recommended approaches that can be implemented to avoid or reduce any negative impacts are outlined as follows:
  - Adhere to and implement the environmental management and monitoring presented in this IEE report will mitigate any adverse consequences;
  - Promote good cooperation among stakeholders, especially between the IA, EA and local authorities;
  - Consult the local communities together with the IAs to update all stakeholders about concerns and issues arising during project construction and operation; and
  - Implement any further investigations that may be needed to develop suitable design of borrow pits with a planned set of multiple use options for the lot owners.



## II. INTRODUCTION

7. In September and early October of 2011 Cambodia was struck by typhoons Nesat and Nalgae which caused severe and widespread floods and destruction in the country. In December 2011, ADB conducted a reconnaissance mission to the country after which ADB issued a MOU which summarized the discussions and understandings reached between Royal Government of Cambodia (RGC) in order to process an Emergency Assistance Loan (EAL) in an effort to provide assistance through a program which should be implemented as early as possible.

8. The "Flood Damage Emergency Reconstruction Project" (FDERP) is an emergency project which was initiated through an EAL; co-funded between ADB and Australia Aid, in order to support a number of reconstruction projects.

9. The scope of this program was further formalized through a MOU in February 2012. The program aims at meeting the needs of repair and/or infrastructure replacements through a range of urgent reconstruction priorities which were caused by the 2011 floods. In May 2012 the first three projects of a planned 12 individual projects were awarded through the Implementation of Ministry of Public Works and Transport (MPWT) with construction start up in early June.

10. The overall scope of FDERP is managed through three Implementation Agencies (IA- i.e. Ministries) which in turn are reporting to the Executive Agency (MEF). The Component under MPWT is one of such Implementation Agencies. The objective of the MPWT projects is to restore critical public and social infrastructure assets in order to restore livelihood and access in project Provinces. This is done through reconstruction of critical bridges and National and Provincial roads.

11. After the MOU of February 2012 was issued, the scope and funding of the various sub projects have been formalized and amended twice; first by an MOUs issued by ADB in July 2012 and more recently in February 2013. The scope and estimated procurement budgets of the program have been revised at the subsequent ADB Missions in 2012 and 2013.

12. The projects which were earmarked as critical included reconstruction of damaged infrastructures in the Provinces of Prey Veng, Kampong Cham, Kampong Thom, Siem Reap, Banteay Meanchey and Battambang.

## III. POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

### A. Policy Framework

13. In 1993 the Royal Government of Cambodia enacted a new Constitution with provision on environmental considerations. Specifically, Article 59 states that *"The State shall protect the environment and balance of abundant natural resources and establish a precise plan of management of land, water, air, wind, geology, ecological system, mines, energy, petrol and gas, rock and sand, gems, forests and forestry products, wildlife, fish and aquatic resource"*. This follows the establishment of the Ministry of Environment (MOE) on the 23<sup>rd</sup> November 1993.

14. The hierarchy of legislations in Cambodia is presented below:

- Royal Decree signed by the King
- Sub-decree signed by the Prime Minister
- Ministerial Decision signed by a Minister
- Regulation issued by a Ministry

15. The major legislation in Cambodia is the Royal Decree which ratifies laws passed by parliament. These can be supplemented by "prakas" or ministerial decisions. These laws allow sub decrees and regulations to be passed which can stipulate procedures and standards to be met in order to ensure compliance with the law. Many of these sub-decrees and standards have been drafted but have not yet been ratified by parliament. However, contractors are still expected to make sure their operations comply with the draft regulations.

## **B. Legal Framework**

### **1. Laws on Environment**

16. Law on Environmental Protection and Natural Resources Management 1996 (NS/RKM/1296/36) came into force and it requires the government to prepare national and regional environmental plans and sub-decrees concerning a wide range of environmental issues, including EIAs, pollution prevention and control, public participation and access to information.

17. Other ministries explicitly mentioned at that time were Ministry of Water Resources, Hydrology and Meteorology and Ministry of Land Use Management, Urbanization and Construction. The list was later expanded to include the Ministry of Public Works and Transport, Ministry of Agriculture, Forestry and Fisheries, Ministry of Rural Development, Ministry of Health and Ministry of Tourism.

### **2. Laws on Historical Monuments**

18. There is a general law in Cambodia which covers all national monuments. This is the "Law on Protection of Cultural and National Heritage, 1996". This is supplemented by the "Decision on the Definition of Three (3) Zones to Protect Temple's Surrounding Areas in all Provinces and Municipalities except Angkor Wat, 1996". These laws protect small temples or ancient structures.

### **3. Laws on Nature Reserves**

19. Royal Decree "Protected Natural Areas" issued in November 1993 gives protection to environment, land, forests, wetlands and coastal zones. This decree covers twenty three (23) locations representing 18% of Cambodia's total area and is under the jurisdiction of MoE.

### **4. Laws on Wildlife**

20. The "Joint Prakas of the Ministry of Environment and the Ministry of Agriculture on Prohibition of Hunting and Catching of Wildlife Animals, 1996" specifically bans hunting of animals and birds for food. A contractor's workers must observe this law.

## **5. Subsidiary Laws on Environmental Protection**

### **a) Sub-decrees and Regulations**

21. The "Law on Environmental Protection and Natural Resource Management" enables the Ministry of Environment to pass sub-decrees and regulations to protect the environment. This subsidiary legislation lays down quantitative standards which must be met by contractors in their operation.

22. Several sub-decrees are already ratified into laws. Others have been drafted and are expected to become law in the near future. Established standards are represented by parameters and values which are used as guide to determine whether or not a regulation is complied. Even if the regulations are in draft form, the contractors are obliged to comply it.

### **b) Sub-Decree on Air and Noise Pollution Control (1999)**

#### **(1) Air Quality**

23. The air pollution regulations are contained in Sub-Decree on Air and Noise Pollution. For dust control, there should no visible emissions from stockpiles of materials, crushers or batching plants. At sensitive receptors a standard of TSP < 0.33 mg/m<sup>3</sup> 24 hour average should be met. All vehicles should be well maintained and comply with the air quality regulations.

#### **(2) Noise**

24. The noise regulations are contained in Sub-Decree on Air and Noise Pollution. The regulations do not stipulate a level for noise from construction sites but refer to mixed commercial / industrial and residential property. Neither do they give the measurement method. Therefore the following standards are recommended. Noise levels at the perimeter of any site should not exceed:

- Continuous Equivalent Level (Leq) = 75dB(A) 12 hours daytime (0700-1900)
- Continuous Equivalent Level (Leq) = 65dB(A) 12 hours nighttime (1900-0700)

25. The descriptor "Continuous Equivalent Level (Leq) is a commonplace measurement and most noise monitoring equipment measures it directly. The measurement is made at the construction site perimeter which makes monitoring easier as it does not require to be exactly on the sensitive area. The level of 75dB(A) daytime / 65 dB(A) nighttime can be adopted which is commonly used in countries such as Singapore and Malaysia.

#### **(3) Vibration**

26. There is no standard for vibration in Cambodia. Therefore the following standard is recommended. The vibration levels at any vibration sensitive property or location should be less than 1mm/second peak particle velocity (ppv) as derived from the US Bureau of Mines publications for avoidance of damage and the UK GLC (Greater London Council) standard for avoidance of nuisance.

### **c) Sub-Decree on Water Pollution Control (No. 27 ANRK.BK 1999)**

27. As a minimum, all discharges of liquid wastes from construction camps, work sites or operations, to streams or water courses should be: BOD ≤50mg/L; Turbidity < 5 NTU; SS

≤50 mg/L; Temperature < 45°C; pH = 6-9; Oil & Grease ≤ 5 mg/L and Dissolved Oxygen > 4mg/L.

28. There is no legal standard for performance of septic tanks but efficiency of its operation should be monitored, that is absence of smell and no overflowing.

**d) Sub-Decree on Solid Waste Management (No. 36 ANRK.BK 1999)**

29. Under the Sub-Decree on Solid Waste Management (No. 36 ANRK.BK 1999), Article 7 "the disposal of waste in public sites or anywhere that is not allowed by authorities shall be strictly prohibited". There are no quantitative parameters given but good sensible practice is expected. Such practices include the following:

- All general waste and food waste should be disposed to government approved landfill.
- All demolition waste must be transported to a government approved location.
- Used oils and other toxic substances should be properly stored. Its treatment or disposal should be coursed through a licensed transporter and treater. Coordinate with the MoE if assistance is needed.

30. Failure to employ sensible precautions may cause sanitation problems to workers living in camps and also may result in prosecution.

**e) Hazardous Substances**

31. There is no specific regulation for hazardous substances in Cambodia. This aspect is covered in the Sub-Decree on Water Pollution Control Annex 1 and Sub-Decree on Solid Waste Management, which give details of classifications of what are defined as hazardous substances. Any hazardous substances must be stored correctly and only disposed in a manner approved by the MoE.

**C. Administrative Framework**

32. There are two particular types of areas of special ecological interest in relation to this project. There are:

**1. Protected Areas**

33. Cambodia has a network of 23 natural protected areas managed by the Ministry of Environment (MoE). These areas cover approximately 3.27 million hectares or 18% of Cambodia's land area and include most of its important habitats. The Forest Administration has also designated protected forests (from cancelled logging concessions) bringing the total area under protection to around 25% which is more than twice the global average. Protected Areas are sites which are protected by Royal Decrees, Laws and Regulations. Such mandatory stipulations are promulgated in Khmer language. These have been obtained and if necessary, translated. The Khmer version takes precedence over the translated version.

34. In 2008 Cambodia introduced the Protected Area Law (No. NS/RKM/0208/007), which defines:

- (i) National Parks
- (ii) Wildlife Sanctuaries

- (iii) Protected Landscapes
- (iv) Multiple Use Areas
- (v) Ramsar Sites
- (vi) Biosphere Reserves
- (vii) Natural Heritage Sites, and
- (viii) Marine Parks

35. Each kind of protected area is described as follows:

- **National Parks** (IUCN category II) – Natural and scenic area of significance for their scientific, educational and recreational values.
- **Wildlife Sanctuaries** (IUCN category IV) – Natural area where nationally significant species of flora or fauna, natural communities, or physical features require specific intervention for their perpetuation.
- **Protected Landscapes** (IUCN category V) – Nationally significant natural and semi-natural landscapes that must be maintained to provide opportunities for recreation.
- **Multiple-Use Areas** (IUCN category VIII) – Areas that provide for the sustainable use of water resources, timber, wildlife, fish, pasture, and recreation with the conservation of nature primarily oriented to support these economic activities. The Tonle Sap Multiple-Use Area was nominated as Cambodia's first Biosphere Reserve in 1997. The Boeung Chmar portion of Tonle Sap Multiple-Use Area (28,000 ha) is designated as a Ramsar site.
- **Ramsar Sites** – There are two sites in the IUCN categories IV and VIII above and one site in the middle stretches of the Mekong River between Stung Treng and the border with Laos.

36. The Law on Forestry Management prohibits the hunting of wildlife within such protected areas as well as maintaining check points and providing rangers.

37. The Ministry of Environment (MoE) has an active community education program to promote environmental awareness especially within the rural communities.

38. This law is recent (2008) and many of the protected areas predate this by many years. Both the original legislation and the most current have been reviewed during this project.

## 2. Important Bird Area

39. An Important Bird Area (IBA) is an area recognized as being a globally important habitat for the conservation of bird populations. Currently, there are around 10,000 IBA worldwide. The program was developed and sites are identified by Bird Life International. These sites are small enough to be entirely conserved and differ in their character, habitat or ornithological importance from the surrounding habitat.

40. Bird Life International is an international organization working to protect the world's birds and their habitats. It is a global conservation federation with a worldwide network of over 100 partner organizations. Bird Life International was founded in 1922 and was originally known as the International Council for Bird Preservation, acting as a lobbying group. It changed its name in 1993 to Bird Life International and is the official IUCN Authority for the Red List for birds.

41. Often IBAs form part of a country's existing protected area network, and so are protected under national legislation. Both the Cambodia's PAWS and the Phnom Samkos Wildlife Sanctuary contain designated IBAs.

### **3. Cambodian IEE Requirements**

42. On 11 August 1999, a Sub-decree on EIA Processes (72 ANRK.BK) was promulgated requiring an initial EIA (IEIA) or EIA for selected projects listed in the sub-decree annex to be submitted by public or private project owners to the MOE for review. (See **Appendix 1**).

43. The Annex to sub-decree No 72 ANRK.BK dated on 11, August 1999 on "**List of the projects that require an IEIA or EIA**" refers to "National Road Construction  $\geq$  100 Kilometers and bridges  $\geq$  30 tones". As this project is rehabilitation of existing roads, and bridges are 25 tones capacity, an EIA is not required by MoE.

## **IV. DESCRIPTION OF PROJECT**

44. Subproject CW13 under stage 3 of FDERP-AF involves the reconstruction of 18.75 provincial laterite road PR No. 1570 of 18.75 km length and 8 m width located in Battambang province (Figure 1).

45. Road signs will be installed in specific locations to forewarn road users on road bends, Children's crossing, narrow carriageway and road junctions etc.

46. Presented below the Location Map of proposed Sub-project CW13.



## **V. DESCRIPTION OF THE ENVIRONMENT**

### **A. Physical Resources**

#### **1. Geography**

47. Cambodia lies in the southwestern part of the Southeast Asian peninsula and has a land area of 181,035 km<sup>2</sup>. International borders are shared with Thailand to the west, the Lao People's Democratic Republic to the north, and the Socialist Republic of Vietnam on the east and southeast. The country is bounded on the southwest by the Gulf of Thailand has a coastline of 440 km.

#### **2. Climate**

48. Cambodia's climate is dominated by the monsoon which causes distinct wet and dry seasons. The southwest monsoon typically brings the rainy season from May to October. The northeast monsoon brings drier and cooler air from early November to March, then hotter air prevails in April and early May. The southern part of the country typically has a two-month dry season whereas the northern areas have a four-month dry season although weather patterns have been changing and what is typical is now increasingly problematic.

#### **3. Rainfall**

49. The annual mean rainfall is 1,400 mm in the central lowland regions and can reach 5,000 mm in coastal areas. However, there are really no reliable rainfall databases for the Project zones and rainfall can vary from a low of less than 1,000 mm to a high of 2,000 mm. The relative humidity is high throughout the year, usually exceeding 90%, and even in the dry season rarely falls below 50%.

#### **4. Temperature**

50. Temperatures are fairly uniform the country, with only small variations from the average annual temperature of around 28°C. January is the coldest month where temperatures as low as 12°C have been recorded and April is the hottest where temperatures reach 42°C. Most of Cambodia's regions have an average wind velocity of less than 3 m/s. Maximum wind speeds can reach in excess of 20 m/s during the wet season. During the dry season the maximum wind velocities are lower and are commonly in the range of 6-8 m/s.

#### **5. Topography**

51. Quoted from GMS (2002), the alluvium forms part of the Cambodian Central Plain that surrounds the Tonle Sap and encompasses the lower Mekong River system in Cambodia, which extends up to Vietnam coast. The plain is featureless apart from a few scattered outcrops of Jurassic Sandstone that occur as small hills that rise steeply to about 100 m asl. The GMS (2002) also described that these hills occur at Phum Liep, Sisophon and Phnom Thom and are the only sources of rock in the area. Elsewhere, several small low north-south tending ridges that typically rise 3-5 m above the plain occur and are sought after as urban sites so as to be above the flood level. The study area, on the other hand, has flat topography.

52. The geology of the Battambang areas is characterized by old alluvium soils (see Geological Map in Figure 2 below) made of sediment deposits from rivers and streams. These are mainly finer sediments, thus a high concentration of silt and clay is found in the ground (CTDP, 2012).



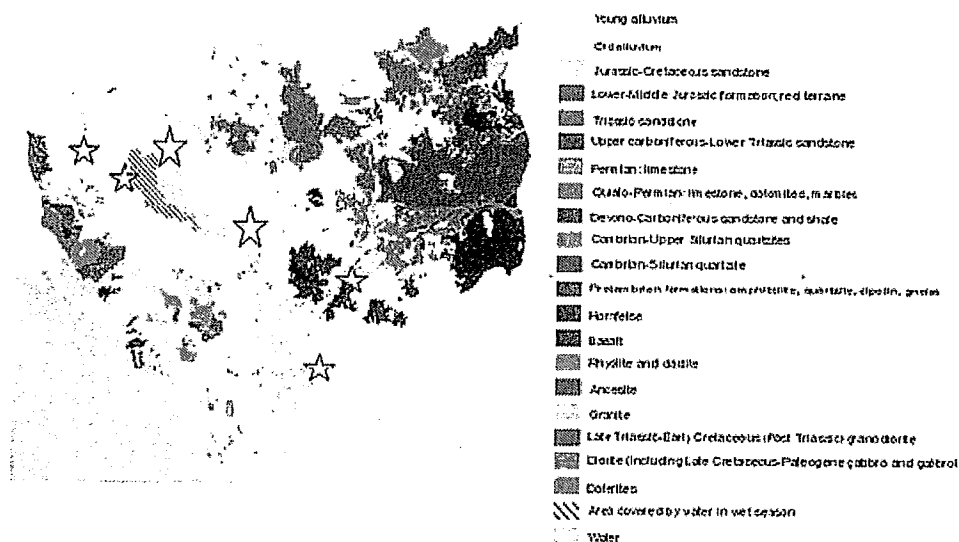


Figure 2: Geology map

(Data source: NREM DATA TOOL BOX – Royal Danish Embassy- Danida - Phnom Penh, Cambodia, March 2007)

53. Data on soil type in the study area is not available. As observed, it has fine and light particles which can easily be washed out or carried by run-off. Some city wastes are dumped on the embankment of the detour road. Based on interview with the locals, such dumping of garbage is only temporary as the access to the existing disposal site is flooded. Regarding soil contamination, there are no signs as well as potential sources found in the area.

54. As to dominant land use, rice fields and cassava surround the project area.

## 6. Air quality

55. Air quality monitoring data is unavailable for this project area as well as for Battambang Province as a whole. The air quality monitoring data undertaken at suburb of Phnom Penh in 2003 is brought for consideration in comparison with national standard, which is shown in Table 1 below.

Table 1: Air Quality Data in Phnom Penh (2003)

DATE	NO <sub>2</sub> (µg/m <sup>3</sup> )	SO <sub>2</sub> (µg/m <sup>3</sup> )	CO (mg/m <sup>3</sup> )	TSP (mg/m <sup>3</sup> )	Pb (µg/m <sup>3</sup> )
Cambodian National Standard	100	300	20	0.33	5
28/10/03	5.70	10.9	0.94	2.8	0.71

29/10/03	18.00	10.4	0.78	2.68	0.05
30/10/03	25.8	4.6	1.46	0.18	0.96
31/10/03	14.9	5.1	1.04	1.25	0.73
4/11/03	20.5	16.5	1.46	3.06	0.68
5/11/03	14.0	4.7	1.56	2.9	0.13
6/11/03	28.0	5.3	1.56	13.42	0.13

Source: JICA, 2004

56. Table 1 indicates that air quality in the study area is within Cambodian national standards for all parameters except total suspended particulates (TSP). TSP levels were measured at levels well above standards on all but one of the monitoring events. Based on local observations have founded that traffic movements on the unsealed road or poor maintenance roads were the major cause of dust generation and deposition in the observation area.

57. The noise in the study area comes from mobile sources. Nevertheless, there is no noise monitoring ever carried out in the project area since the time the sub decree on the Controlling of Air Pollution and Noise Disturbance (July 2000) was enforced.

## 7. Surface Water Quality

58. The project roads cross a number of streams and irrigation canals. Surface water in the project area is generally used for irrigation purposed and domestic use. Within the projects are surface run-off on exposed soil and erosion of lake embankments cause turbidity in some of the watercourse. Surface water pollution from domestic sewage along sections where densely populated villages are found and run-off surrounding agricultural field may also be expected.

59. There is no information on water quality of surface water within the project area. Table 2 provides the Cambodia national standard for surface water for consideration in order to protect the current surface water quality during project implementation.

Table 2: Cambodia national standard for surface water quality

No.	Parameters	Unit	MIME DWQS
1	pH	-	6.5 – 8.5
2	Temperature	°C	-
3	Total Suspended Solid (TSS)	mg/l	25 - 100
4	Total Dissolved Solid (TDS)	mg/l	800
5	Dissolved Oxygen (DO)	mg/l	2.0 – 7.5

6	Turbidity	NTU	5
7	Alkalinity	mg/l	-
8	Total Hardness	mg/l	300*
9	Nitrite (NO <sub>2</sub> )	mg/l	3
10	Nitrate (NO <sub>3</sub> )	mg/l	50
11	Sulphate (SO <sub>4</sub> )	mg/l	-
12	Fluoride (F)	mg/l	-
13	Chloride (Cl)	mg/l	250
14	Ammonium (NH <sub>4</sub> )	mg/l	-
15	Sulphide (S)	mg/l	-
16	Color	TCU	5
17	Biochemical Oxygen Demand(BOD)	mg/l	1.0 – 10.0
18	Chemical Oxygen Demand ( COD)	mg/l	-
19	Total Phosphorus (TP)	mg/l	-
20	Cyanide (CN)	mg/l	0.07
21	Aluminium (Al)	mg/l	-
22	Arsenic (As)	mg/l	0.05
23	Cadmium (Cd)	mg/l	0.003
24	Chromium (Cr)	mg/l	0.05
25	Copper (Cu)	mg/l	1
26	Iron (Fe)	mg/l	0.3
27	Lead (Pb)	mg/l	0.01
28	Manganese (Mn)	mg/l	0.1
29	Mercury (Hg)	mg/l	0.001
30	Selenium (Se)	mg/l	0.01
31	Zinc (Zn)	mg/l	3
32	Total Coliform	Count/100 ml	0
33	E-Coli	MPN/100 ml	0

MIME DWQS – Ministry of Industry Mines and Energy, Drinking Water Quality Standard, January 2004

\* Hardness is expressed as mg/L CaCO<sub>3</sub>



*Figure 3: The surface water of daily use in community*

#### **8. Groundwater**

60. Groundwater is used by the local people both for domestic and commercial uses. Based on interview, water quality and quantity are affected during dry season. Monitoring of volume and quality, however, has not been undertaken in the project area.

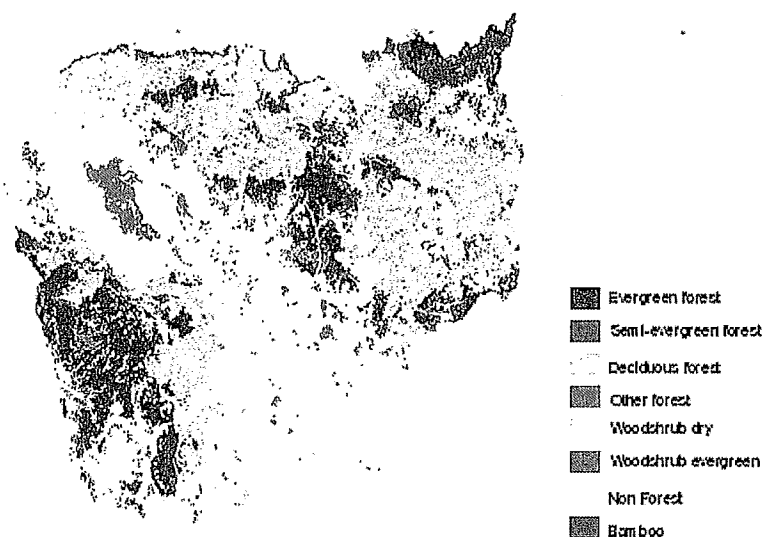


*Figure 4: The tube wells of daily use in community*

## **B. Biological Environment**

### **1. Forest and vegetation**

61. The natural forest in the project area has been converted into agricultural lands as shown in Figure 5. Common vegetation observed in the subprojects' locations are coconut, mango, papaya, banana, jackfruit and others, however, these will not be removed during construction of the project.



*Figure 5: Land use map*

Source: CTD, 2012

### **2. Protected areas**

62. Cambodia in 1993, 23 protected areas is covered 3.3 million ha equivalent to more than 18% of the country territory had been designated and categorized as National Parks (742,250 ha); Wildlife Sanctuary (2,030,000 ha); Protected Landscape (9,700 ha) and Multiple Use Management Areas (403,950 ha). Of all the PAs, three cover mixed terrestrial and coastal habitats, one includes terrestrial, coastal and near-shore marine waters and islands, one covers inland wetlands (316,250 ha) and seven are trans-boundary PAs. Marine habitats remain poorly represented in the current PAs system. In addition, ten Forest Protected Areas covering 1.49 million ha have been established. Five PAs have potential for trans-boundary collaboration. The protected area system is mainly based on forest reserves developed in the 1950s as well as limited information in the early 1990s. This information was incomplete and uncertain. Habitats that are considered missing or underrepresented include lowland evergreen forests, revering forests, limestone forest and marine areas (Third National Report on the Biological Diversity Conservation, 2006).

63. While the 23 PAs were established under the authority of the Ministry of Environment, other 10 protected forests Areas have been designed under the Ministry of Agriculture, Forestry and Fisheries. The Forest Protected Areas system covers over 1.49 million ha. Additionally, almost all the mountain ecosystems in the country fall within the national PAs and Forest Protected Areas systems.

64. In Cambodia, a number of protected conservation areas are approximately covered 5.4 million hectares. There are consisting of 7 national parks, 9 wildlife sanctuaries, 3 protected landscape areas, and 3 protected areas. The national parks are located in the coastal, mountain, plateau and lake region which are covered 742,300 million hectares and wildlife sanctuaries in these regions are covered 4.138 million hectares. The protected landscapes areas are covered 97,000 hectares include archaeological and cultural sites and protected areas are covered 403,900 hectares, see Figure 6 and Table 3 is indicated on the protected areas within the Cambodia.

65. Based on this information, there are no protection areas in the project area.

Table 3: Natural protection areas in Cambodia

Description	Surface (ha)	Location
<b>I. National Parks</b>		
1. KIRIRUM	35,000	Kg. Speu and Koh Kong
2. BOKOR	140,000	Kampot
3. KEP	5,000	Kapot
4. REAM	150,000	Sihanouk Ville
5. BOTUM SAKOR	171,250	Koh Kong
6. PHNOM KOULEN	37,500	Siem Reap
7. VIRAK CHEY	332,500	Stung Treng and Rattanak Kiri.
<b>II. Wildlife sanctuaries/Preserves</b>		
8. PHNOM ORAL	253,750	Koh Kong, Pursat, Kg. Chhnang
9. PEAM KRASAUB	23,750	Koh Kong
10. PHNOM SAMKOS	333,750	Koh Kong, Pursat
11. RONEAM DONSAM	178,750	Battambang
12. KOULEN PRUM TEP	402,500	Siem Reap and Preah Vihear
13. BENG PER	242,500	Kg. Thom
14. LUMPHAT	250,000	Rattanak Kiri and Mundul Kiri.
15. PHNOM PRICH	222,500	Mundul Kiri and Kratie
16. PHNOM NAMLEAR	47,500	Mundul Kiri
17. SNUOL	75,000	Kratie
<b>III. Protected scenic view areas</b>		
18. ANGKOR	10,800	Siem Reap
19. BANTEAY CHHMAR	81,200	Banteay Mean Chey
20. PREAH VIHEAR	5,000	Preah Vihear
<b>IV. Multi purposes areas</b>		
21. DONG PENG	27,700	Koh Kong
22. SAMLOT	60,000	Battambang
23. TONLE SAP	316,250	Kg. Chhnang, Kg. Thom, Siem Reap, Battambang and Pursat.

Source: The Royal Decree on Natural Protected Areas, Nov. 1993.

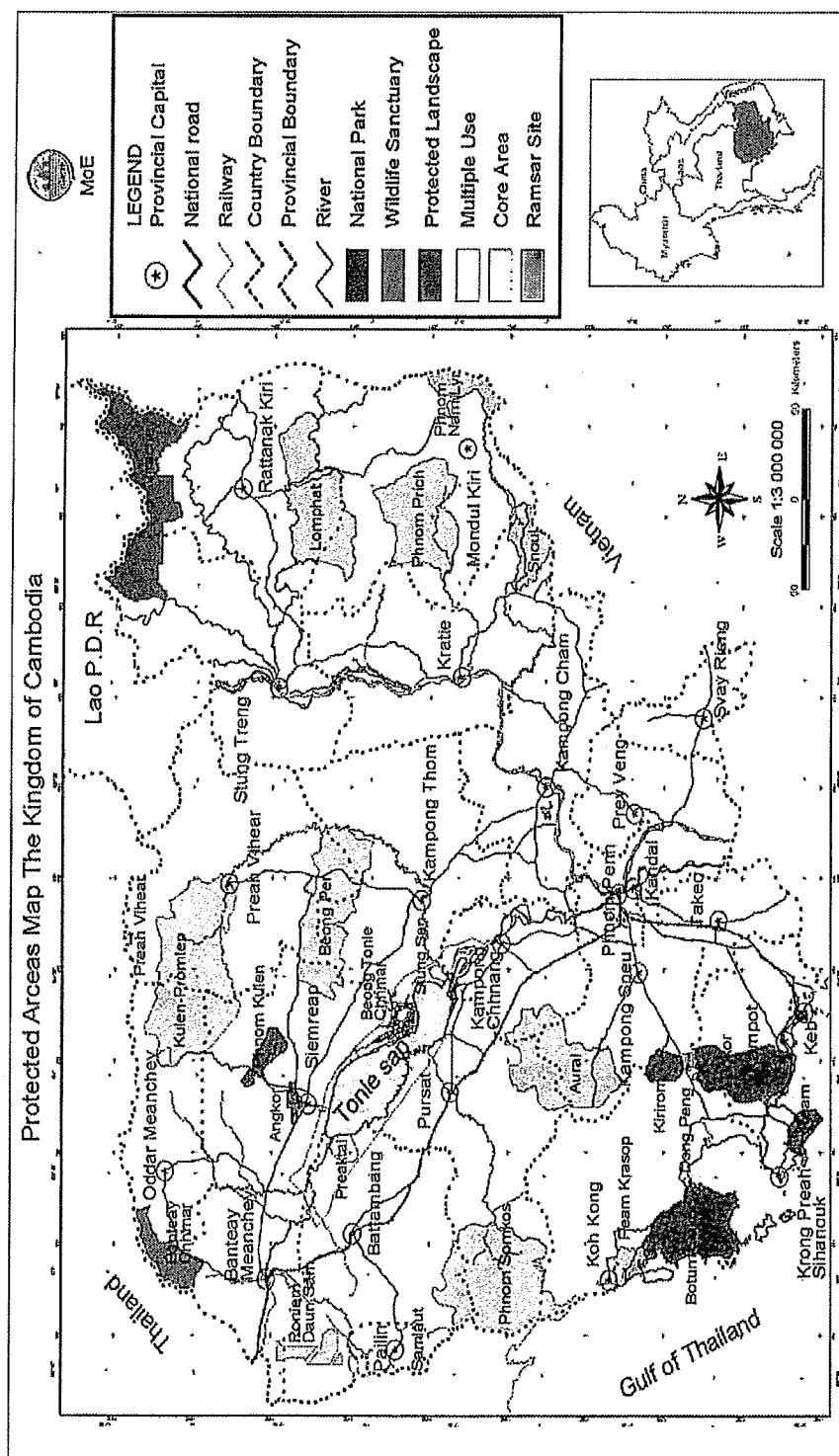


Figure 6: Map of protected areas in Cambodia

### 3. Wildlife and Endangered Species

66. As lands are mostly converted into agricultural and residential uses, wildlife and endangered species, in particular, were not observed in the project area. Terrestrial ecosystem in the study area has low biodiversity. Some cows and buffaloes can be seen around the location.

### 4. Aquatic Resources

67. According to the statistical Yearbook 2011, by National Institute of Statistics, Ministry of Planning indicated that in Cambodia the total inland fisheries production there were 405.0 thousand tons in 2010, compared to 390.0 tons in 2009. The fish caught by community fishermen and inundated rice field fishing increased 4.35 percent from 115.0 thousand tons in 2009 to 120 thousand tons in 2010.

68. Cambodian people in rural areas rely heavily on fisheries for their subsistence. Fish provide from 40- 60% of animal protein intake for people in rural areas – even those living far from water. An average of 76 kg of fish is consumed per person/year. The value of the river fish capture is estimated at about USD 0.68 per kilogram, while the value of aquaculture is approximately USD 1.05 per kilogram (Source: Baran 2005).

69. Fisheries provide a possibility for income generation with very little capital investment and no land needed. In Cambodia as a whole 1995-96, 39% of households were involved in fishing and 77% of them were involved in farming as production and income-generating activities. More than 50% of the fishing households indicate that their supply of fish comes mainly from family fishing in rivers, lakes and in flooded rice fields. 10.5% of the households have fishing or a fishing related activity as the primary occupation while another 34.1% are engaged on a part-time basis. There are more than 100 fish species in Mekong River, see Table 4.

Table 4: Fish commonly found in the Mekong River and floodplain areas

No.	Local name	Science name	English name
1	Trey Riel	Henicorhynchis spp.	
2	Trey Pro Ma	Boesemania microlepis	Smallscale ardherfish
3	Trey Kantrop	Pristolepisfasciata	Catopra
4	Trey Linh	Thynnichthys thynnoides	Whit lady carp
5	Sloek Russey	Paralaubuca typus	
6	Trey Kanhchos Kdong	Heterobagrus bocourti	
7	Trey Kanhchos Chhot	Mystus micracanthus	
8	Trey Kanhchos Para	Leiocassis siamensis	
9	Trey Kanhchos Pruy1	Mystus micracanthus	
10	Trey Kanhchos Pruy2	Mystus micracanthus	
11	Trey Ros/Phtuok	Channa striata	Chevron snakehead
12	Trey Kes	Micronema apogon	Common sheatfish
13	Trey Kes	Micronema micronema	Common sheatfish
14	Trey Kaek	Morulus kryophekadion	Black sharkminnow



15	Trey Chhkok Moul	Cyclocheilichthis enoplos	Soldier river barb
16	Trey Chhkok Kdar	Albulichthys albuloides	
17	Trey Sraka kdam	Cyclocheilichthis lagled	
18	Trey Chrakeng	Puntioplites waandersi	
19	Trey Pruol/kraland	Cirrhinus micropelis	Small scale mud carp
20	Trey Krom	Osteochilus melanopleura	
21	Trey Chhdor/Diep	Channa micropeltes	Giant snake head
22	Trey Ta aun	Ompok hypophthalmus	Whisker sheatfish
23	Trey Chhpín	Hypsibarbus lagleri	Tawes
24	Trey Chhpín	Hypsibarbus malcolmi	Tawes
25	Trey Slat	Notopterus notopterus	Bronze featherback
26	Trey Po	Botia spp.	Speckletail botia
27	Trey Kanhchrouk Krohorm	Botia eos	Spotted gouranii
28	Trey Kanhchrouk Chhot	Botia helodes	Spotted gouranii
29	Trey Kanhchrouk Loeung	Botia lecontei	Spotted gouranii
30	Trey Kanhchrouk	Botia morleti	Spotted gouranii
31	Trey Kampheanh	Mystus nemurus	
32	Trey Chhlang	Rasbora torneieri	
33	Trey Changva moul	Rasbora borapetensis	
34	Trey Changva Chhot	Rasbora daniconius	
35	Trey Changva	Rasbora myersi	
36	Trey Kros	Wallago attu	
37	Trey Sanday	Pangasius lamarum	
38	Trey Phtong	Xenentodon spp.	
39	Trey Angkat Prak	Puntius brevis	
40	Trey Pra	Pangasius spp.	Catfish
41	Trey Pra Kandol	Pangasius bocourti	
42	Trey Prawloug	Leptobarbus hoeveni	Hoeven's slender carp
43	Trey Khman	Hampala macrolepidota	
44	Trey Bandol Ampouv	Clupeoides borneensis	
45	Trey Kahae	Barbodes altus	
46	Trey Kranh	Belodontichthys dinema	
47	Trey Klanghay	Trichogaster pectoralis	Snakeskin gourami
48	Trey Kanthor	Anabas testudineus	Charming perch
49	Trey Kambot Chromioa	Sikukia gudgeri	
50	Trey Ampil Toun	Systomus orphoides	
51	Trey Chanteas Phloug	Parachanna siamensis	
52	Trey Chveat	Pangasius siamensis	

53	Trey Chveat	<i>Pangasius pleurotaenia</i>	
54	Trey Chveat	<i>Pangasius polyuranodon</i>	
55	Trey Kampoul Bay	<i>Cosmochilus harmandi</i>	
56	Trey Damrey	<i>Oxyeleottilis mannorata</i>	Sand goby
57	Trey Trawsaw	<i>Probabus jullieni</i>	Seven-line barb
58	Trey Kol Raing	<i>Catlocarpio siamensis</i>	Giant Mekong barb
59	Trey Reach	<i>Pangasianodon gigas</i>	Giant Mekong catfish
60	Trey Prawma	<i>Boesemanina microlepis</i>	Smallscale croaker
61	Trey Chunluonh Moan	<i>Coilia macrognathos</i>	Longjaw grenadier anchovy
62	Trey Chhma	<i>Setipinna melanochir</i>	Dusky hairfin anchovy
63	Trey Dang khteng	<i>Macrochirichthys macrochirus</i>	
64	Trey Chhkuk Tituy	<i>Albulichthys albuloides</i>	
65	Trey Phka kor	<i>Cyclocheilichthys armatus</i>	
66	Trey Lolok Saw	<i>Paropuntius deauratus</i>	
67	Trey Changva Ronong	<i>Lobocheilos melanotenia</i>	
68	Trey Kamphliev	<i>Kryptopterus cryptopterus</i>	Frecklefin eel
69	Trey Khchung	<i>Macrogynatus maculatus</i>	Fringed threadfin
70	Trey Kompream	<i>Polynemus multifilis</i>	Small scale archerfish
71	Trey Kancheak sla	<i>Toxotes microlepis</i>	Golden tank goby
72	Trey Khsan	<i>Glossogobius aureus</i>	Mekong blind sole
73	Trey Andat Chhkae	<i>Typhlachirus elongatus</i>	
74	Trey Kampot	<i>Monotetra cambodgiensis</i>	Iridescent glassy perchlet
75	Trey Kanchanh Chras	<i>Parambassis apogonoides</i>	Duskyfin glassy
76	Trey Kantrang Preng	<i>Parambassis wolffi</i>	Laotian shad
77	Trey Kbork	<i>Tenuulosa thibaudeaui</i>	
78	Trey Changwa chunh chuak	<i>Crossocheilus reticulatus</i>	
79	Trey Po Khmao Tracheak	<i>Pangasius larnaudi</i>	
80	Trey Po Pruy	<i>Pangasius larnaudiei</i>	
81	Trey Chhviet	<i>Pangasius macromemus</i>	
82	Trey Ke	<i>Pangasius nasutus</i>	
83	Trey Po Pruy	<i>Pangasius sanitwongeti</i>	
84	Trey Khlang Hay	<i>Belodintichthys dinema</i>	
85	Trey Krar Paot/San day	<i>Wallago attu</i>	
86	Trey Chay Krar Peu	<i>Microphis boaja</i>	
87	Trey Phtaung	<i>Hemiramphus mogguardianus</i>	
88	Trey Priem	<i>Polynemus longipectoralis</i>	

89	Trey Spong	Lates calcarifer	
90	Trey Kantrang Preng	Ambassis wolffi	
91	Trey Kanchanh Chras	Ambassis ranga	
92	Trey Pama	Pseu-dosciaena soldado	
93	Trey Kanhcheak Sla	Toxotes chatareus	
94	Trey Sbaica	Cymbium cambodgiense	
95	Trey Andat Chhker	Cynoglossus microlepis	
96	Trey Pa phak	Scaphognathops bandanensis	
97	Trey Kap	Thryssocypeis tonlesapensis	
98	Trey Kantuy Krohorm	Discherodontus ashmeadi	Redtail barb
99	Trey Khman	Hampala macrolepidota	
100	Trey Saka Keo	Rainmas guttatus	Barilius Guttatus
101	Trey Khla	Systemus partipentazona	Puntus tetrazona
102	Trey Kknang Veng	Dangila sp. cf. auvieri	
103	Trey Khnang Veng	Dangila lineata	
104	Trey Dang Dav	Luciosoma bleekeri	
105	Trey Borbel		
106	Trey Kaok	Arius stormi	Sona sea catfish
107	Trey Kaok	Arius thalassinus	Giant sea catfish
108	Trey Kyar	Mystus wyckioides	
109	Trey Tanel	Mystus ilamentus	
110	Trey Andeng Tun	Clarias macrocephalus	Broad heah catfish
111	Trey Andeng Reong	Clarias batrachus	Walking catfish
112	Angtung	Monopterus albus	Swamp ell
113	Trey Russei Chek	Acantopsis sp. 1	
114	Trey Russei Chek	Acantopsis sp. 2	
115	Trey Russei Chek	Acantopsis sp. 3	
116	Trey Trosak	Probarbus jullieni	
117	Trey Trosak Sor	Probarbus labeamajor	
118	Trey Arch Kok	Dangila lineata	
119	Trey Pkhar Char	Cirrhinus jullieni	Osteochilus simus

Source: Fisheries and aquaculture development and environment impact review 2011

### **C. Socio-Economic Conditions**

#### **1. Population**

70. Battambang is a province of Cambodia located in the far northwest. Bordering provinces are Banteay Meanchey to the north, Pursat to the east and south, Siem Reap to the northeast and Pailin to the west. The northern and southern extremes of the province's western boundaries form part of the international border with Thailand. In addition, Tonle Sap forms part of the northeastern boundary between Siem Reap and Pursat, its capital and largest city is Battambang.

71. The total population in Battambang is 1,024,663 persons (census 2008) that growth very fast if compared to the total population in year 1998, has only 793,129 persons (census 1998). At the present, the population density is 89 persons per km<sup>2</sup>. The average family member is 4.8 persons and annual population increasing rate is 2.28 percent.

#### **2. Poverty**

72. In Cambodia, the population living under the national poverty line of US\$0.93 per capita per day in 2009 (Ministry of Planning, 2013) is defined as the poor, about 22.9% of Cambodians live below the national poverty line indicating that at least one in five Cambodians are still living in deprivation. They lack sufficient resources to meet their daily needs. Cambodia's long history of violence and conflict, both internally and externally has contributed to the current poverty situation. Most notably in Cambodia's troubled history was the Khmer Rouge regime and a period of occupation under Vietnam's communist leaders from 1980 to 1989. As such, it was not until recently did the political situation in Cambodia settled down. Since then, its economy has been growing from strength to strength, driven by the expansion in the garment, construction, tourism and agricultural sector.

#### **3. Employment**

73. The economic and social development in a country depends on the number of persons who are economically active.

74. The census (2008) shows that the total population in 2008 was 13,395,682 persons of which 6,935,246 persons were employed, and 118,152 persons unemployed. By comparison, the numbers of un-employment in the country decreased from 273,183 persons in 1998 to 118,152 in 2008 (Table 5).

*Table 5: Status of employment*

<b>Status of employment</b>	<b>1998</b>	<b>2008</b>
	<b>Persons</b>	<b>Persons</b>
Total population in Cambodia	11,437,656	13,395,682
Employment	4,845,762	6,935,246
Unemployment	273,183	118,152
Urban Population	2,095,074	1,299,677
Employment	761,998	1,233,174

Status of employment	1998	2008
	Persons	Persons
Unemployment	95,235	58,337
Rural Population	9,342,582	12,096,005
Employment	4,083,764	5,702,072
Unemployment	177,948	59,815

Source: Population census (2008)

#### 4. Land Use and Facilities

75. Land use in the vicinity of the PR 1570 is mixed of residents, small-scale business shops, electrical/motorcycle repairing shops and agricultural fields in both side of the project area. There also have schools, health care centers, religious building (i.e. pagodas) and commune/village administrative buildings located adjacent to the project area. Photos of land use and facilities are enclosed in Appendix 3.

76. There is a tourist destination (Kampinh Poy Basin Resort) nearby the project area.

#### 5. Cultural and Archeological Sites

77. Based on field observation, there is no pagoda or archaeological site located in the project area. However, there were found the religious building like pagodas along the project area of PR 1570.

## VI. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

### A. Environmental Assessment Methodology

78. The Initial Environmental Examination (IEE) provides an analysis of possible impacts associated with the reconstruction the proposed of road. This IEE was undertaken using mostly secondary data, the review of previous reports, reference to the EARF, and implementation of short fieldwork missions. The objective was to assess the potential negative impacts of the subprojects on the physical, biological and socio-economic environment, and to identify to mitigate or avoid any expected adverse impacts.

79. The analysis of potential impacts has been undertaken for four (4) key aspects: (i) project location, (ii) design, (iii) construction, and (iv) operation. The potential impacts are classified by degree of significance, which are defined as follows:

- Not significant (D1): No impact from the project activity
- Small impact (D2) - low probability of occurrence and low magnitude of any impact occurring on the environment.
- Moderate impact (D3) – Moderate probability of occurrence and moderate magnitude of any impact occurring on the environment.

- Major impact (D4) – high probability of occurrence and high magnitude of any impact occurring on the environment.
- (+) = beneficial impact

80. The impacts are also assessed according to duration as follows:

- Short term = less than 1 year,
- Medium term = 1 to 5 years,
- Long term = More than 5 year.

#### ***B. Screening of environmental impacts***

81. TA preliminary screening of potential environmental impacts from the project is undertaken for each of the three following stages:

- Pre-construction: Occurs during project design and during completion of detailed design and land acquisition.
- Construction: Occurs during project construction, including vegetation clearing, earthworks, and bridge construction.
- Operation: Occurs after completion of bridge construction.

82. The list of potential impacts identified for the Project is presented in Table 6. The project work involves road reconstruction. However, no major impacts are expected. The majority of impacts occur only during project construction. The planned and corresponding mitigation measures are presented in the same Table.

Table 6: Environmental management plan (EMP)

Project Phase	Project Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities	
				Implement	Supervise
1. Pre-Construction	Detailed Engineering Design	1. Loss of trees (during site clearing and quarrying of construction materials)	<ul style="list-style-type: none"> <li>On the design stage, ensure that there are acceptable alternative borrow pit areas that would have an overall beneficial advantage in terms of improved livelihood and reduced environmental impact.</li> </ul>	DDIS Consultant, IA/EA, in cooperation with contractor	DDIS Consultant, IA/EA
		2. Damage to existing structures	<ul style="list-style-type: none"> <li>The design should maximize benefits or avoid impacts on assets. Resettlement framework for the Project and Cambodian laws, policies, and regulations should be complied with.</li> </ul>	DDIS Consultant, IA/EA	DDIS Consultant, IA/EA
		3. Risk of land mine or UXO	<ul style="list-style-type: none"> <li>Consultative meetings with local communities are necessary to know clearly where there are risks of mines or UXO. Unsafe areas should be cleared before project implementation.</li> </ul>	DDIS Consultant, IA/EA	DDIS Consultant, IA/EA
2. Construction	Earthworks, site clearing, hauling of construction materials, piling	4. Dust generation	<ul style="list-style-type: none"> <li>The Contractor will be required to formulate and implement a Dust Abatement Program that includes spraying of water on roads and</li> </ul>	Contractor	DDIS Consultant, IA/EA

Project Phase	Project Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities	
				Implement	Supervise
	works, Operation of construction/ workers' camps, borrow operation, hauling of construction wastes to spoil sites		<p>work areas within villages close to the road.</p> <ul style="list-style-type: none"> <li>Vehicles transporting materials should be covered with tarpaulin or similar material</li> </ul>		
		5. Noise and vibration	<ul style="list-style-type: none"> <li>The Contractor should consider proper scheduling of construction activities particularly in sensitive areas. Acoustic barriers or enclosures for working areas should be provided.</li> </ul>	Contractor	DDIS Consultant, IAVEA
		6. Water contamination/ quality	<ul style="list-style-type: none"> <li>Waste/used oil should be collected, properly stored and disposed to an approved site. Storage should be in drums raised off the ground and properly covered to keep rain water out. Lining or pan should be provided to contain any spills and simplify clean up.</li> </ul>	Contractor	DDIS Consultant, IAVEA
			<ul style="list-style-type: none"> <li>The Contractor shall prepare a Spill Management Plan (including measures to be taken and equipment to be used) to ensure</li> </ul>		



Project Phase	Project Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities	
				Implement	Supervise
			adequate cleanup of any spills. <ul style="list-style-type: none"> <li>Avoid discharging of petrol, or lubricants into stream, reservoir or land.</li> <li>Construction shall be worked during the dry season.</li> </ul>		
		7. Water-borne disease	<ul style="list-style-type: none"> <li>Fill-up depressed areas to prevent water ponding which may be used as breeding ground for disease-carrying organisms mosquitoes</li> <li>Borrow pits may be convert to aquaculture or be developed as water reservoir for community use if agreed during consultation.</li> </ul>	Contractor.	DDIS Consultant, IAVEA
		8. Water flow	<ul style="list-style-type: none"> <li>Do not water blockage</li> <li>Provide adequate cross drainage</li> <li>Construction of divert water flow</li> </ul>	Contractor	DDIS Consultant, IAVEA
		9. Loss of agricultural land for borrow pits	<ul style="list-style-type: none"> <li>The contractor will use only licensed borrow operators. There will be no side borrow permitted,</li> </ul>	Contractor	DDIS Consultant, IAVEA

Project Phase	Project Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities	
				Implement	Supervise
			<p>unless agreed to with roadside residents.</p> <ul style="list-style-type: none"> <li>The contractor will be responsible for rehabilitating any borrow sites opened and operated by them</li> </ul>		
		10. Loss of trees	<ul style="list-style-type: none"> <li>Tree clearing should be avoided as much as possible;</li> <li>The borrow pits will need to be re-vegetated before being handed back to the owner, or could be used for aquaculture.</li> <li>Tree planting should be carried out in the appropriate location of the road. Coordinate with MoE regarding the species of trees to be used.</li> </ul>	Contractor	DDIS Consultant, IA/EA
		11. Soil erosion	<ul style="list-style-type: none"> <li>The contractor will be required to employ appropriate construction methodology, consider appropriate timing or season, implement soil erosion control to minimize soil erosion and sedimentation of waterways. The alternative</li> </ul>	Contractor	DDIS Consultant, IA/EA

Project Phase	Project Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities	
				Implement	Supervise
			approaches should be: (1) provide adequate cross drainage to avoid over flow or flooding and (2) re-vegetation of erosion-prone areas		
		12. Generation of wastes	<p>Contractor should formulate and implement a Waste Management Plan. This should include :</p> <ul style="list-style-type: none"> <li>• implement waste segregation (recyclables/biodegradable/residual wastes)</li> <li>• designate an appropriate location as temporary staging area for excavated materials and other waste</li> <li>• provide sufficient garbage containers in the construction camps and at work site</li> <li>• regular disposal of wastes to an approved landfill or site should be implemented</li> <li>• provide sanitary facilities for workers; this should be cleaned and maintained regularly</li> </ul>	Contractor	DDIS Consultant, IA/EA

Project Phase	Project Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities	
				Implement	Supervise
			<ul style="list-style-type: none"> <li>Upon completion of construction works, camps and work sites used should be restored to its original or better condition.</li> </ul>		
		13. Traffic congestion, Safety and Health	<p>The contractor should formulate Traffic Management Plan and health and safety plan. This should include the following:</p> <p><b>Safety</b></p> <ul style="list-style-type: none"> <li>Install traffic/warning signs like "safety first" at the construction area including fences or enclosures</li> <li>keep the roadway or bypass accessible to commuters to avoid traffic jam</li> <li>park at designated area.</li> <li>Detour road should be provided and accessible to commuters</li> <li>Temporary access of equipment and trucks must be established and approved by the sub-district officials</li> <li>Workers should be provided with</li> </ul>	Contractor	DDIS Consultant, IA/EA

Project Phase	Project Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities	
				Implement	Supervise
			Personal Protective Equipment <b>Health</b> <ul style="list-style-type: none"> <li>• A trained first aid personnel and health facility should be provided on site and in camp site.</li> <li>• Potable water and sanitary facilities should be provided to workers.</li> <li>• To prevent the transmission of HIV/AIDS, the contractor should incorporate on the health and safety plan the education of workers about sexually transmitted disease.</li> </ul>		
		14. Generation of employment	<ul style="list-style-type: none"> <li>• The contractor should comply with the Labor and Gender Action Plan ; employ people from villages including women and unskilled workers</li> </ul>	Contractor	IA/EA , local authorities
3.Operation Phase	Use of bypass and the bridge	15. Traffic accident	<ul style="list-style-type: none"> <li>• Provide traffic signs</li> </ul>	IA/EA	IA/EA, local authorities

83. Such impacts are briefly discussed below:

**1. Environmental impacts related to project design**

**a) Loss of trees**

84. Although the project will only involve improvement of the existing road, there are still indirect potential impacts on trees and natural forest depending on the location of borrow pits to be used as source of earthwork.

85. Ensure that there are acceptable alternative borrow pit areas that would have an overall beneficial advantage in terms of improved livelihood and reduced environmental impact.

**b) Damage to existing structures**

86. As observed, small stalls and trees will be damaged by the project. To lessen the project impacts, the road and temporary access were designed in such a way that trees and adjacent structures will not be affected. Resettlement framework for the Project and Cambodian laws, policies, and regulations should be complied with.

**c) Risk of Land Mine and UXO**

87. The new road will be constructed in the same location, however, the risks remain since there may be deep seated mines that could be exploded by heavy construction equipment.

88. Consultative meetings with local communities are necessary to know clearly where there are risks of mines or UXO. Unsafe areas should be cleared before project implementation.

**2. Environmental issues related to project construction**

**a) Dust Impacts (D3)**

89. Generation of dust is expected during earthworks and from hauling of construction materials to site. Dust pollution could be a nuisance to communities who live adjacent to the site, especially during dry season. The dust will also affect aesthetics.

90. The Contractor will be required to formulate and implement a dust control program that includes spraying of water on roads and work areas within villages close to the road. Vehicles transporting materials should be covered with tarpaulin or similar material.

**b) Noise Impacts (D2)**

91. Similar to dust, operation of construction equipment and transporting materials will cause temporary noise and vibration. Communities close to work areas will be affected.

92. The Contractor should consider proper scheduling of construction activities particularly in sensitive areas. Acoustic barriers or enclosures for working areas should be provided where required.

**c) Generation of wastes (D2)**

93. During subproject construction, various wastes will be generated. Potential sources are wastes from construction workers, site clearing, excavation, dismantling of old structures and from other construction-related activities. If not properly managed, it will be effected the health and sanitation in the subproject area. Garbage dump area will serve as breeding ground for disease-carrying species. Waste may even clog the drainage system.

94. Contractor should formulate and implement a Waste Management Plan where required as a results of construction and camp activities. This should include: employ waste segregation (recyclables/biodegradable/residual wastes), designate an appropriate location as temporary staging area for excavated materials and other waste, provide sufficient garbage containers in the construction camps and at work site, regular disposal of wastes to an approved landfill or site should be implemented, provide sanitary facilities for workers which should be cleaned and maintained regularly. Upon completion of construction works, camps and work sites used should be restored to its original or better condition.

**d) Water contamination (D2)**

95. The most severe water quality impact would be from bitumen, diesel fuel or used oil. These substances are toxic to living organisms as well as water quality in the project area.

96. Contractor has to ensure that: (i) Diesel and waste oil are to be handled and stored properly to prevent leakage or spill. (ii) Waste oil is to be collected, stored and disposed to an approved site (according to national standard). (iii) Storage is to be in drums, raised off the ground, covered to keep rain out and surrounded by a bund to contain any spills and simplify clean up. (iv) The Contractor shall prepare a Spill Management Plan (including measures to be taken and equipment to be used) to ensure adequate cleanup of any spills.

**e) Water-borne disease (D1)**

97. Borrow pits may hold water and can serve as breeding grounds for mosquitoes causing dengue fever.

98. Contractor must ensure that (i) solid wastes are regularly disposed into safe landfill. (ii) Sitting camps distant to community's where appropriate and removal of stagnant water areas, and (iii) borrow pits may be utilized for aquaculture or be developed as water storage for community use.

**f) Water flow (D3)**

99. Water blockage for road construction will effect to water flow. Moreover, it will impacts for local villagers who are living at the downstream which needs water for their irrigation and daily use.

100. Contractor has to ensure that road construction will not be impacted of water flow. The alternative approaches should be: (i) do not blockage, (ii) provide adequate cross drainage of water flow and (iii) construct divert of water flow.

**g) Soil erosion (D3)**

101. Soil erosion usually occurs during site clearing, embankment works and other earth moving works. When heavy rain comes, sediments are carried into ditches, culverts, nearby water bodies and adjacent lands.

102. The contractor will be required to implement soil erosion control to minimize soil erosion and sedimentation of waterways. The alternative approaches should be: (1) provide adequate cross drainage to avoid over flow or flooding and (2) re-vegetation of erosion-prone areas.

**h) Loss of trees (D1)**

103. The project will only improve the existing roads, bridges and drainage structures. Impact on trees is insignificant.

104. The borrow pits will need to be re-vegetated before being handed back to the owner, or may be used for aquaculture.

105. Tree clearing should be avoided as much as possible and tree planting carried out where appropriate in order to enhance the environment around the road.

**i) Loss of agricultural land for borrow pits (D1)**

106. Quarrying filling materials from the rice fields will reduce areas used for rice production. It is expected that the volume of rice that can be planted and be harvested will decrease.

107. The contractor will use only licensed borrow operators and borrow areas. There will be no side borrow permitted, unless agreed to with roadside residents.

108. The contractor will be responsible for rehabilitating any borrow sites opened and operated by them.

**j) Traffic congestion, Safety and Health (D2)**

109. Traffic congestion normally occurs during construction of roads, bridges and drainage structures on major thoroughfares. Accidents inevitably happen also during construction. Some motorists drive at high speed and without lights at night time, construction equipment not properly park, construction wastes piled along roads and no warning signs on deep excavations.

110. The contractor should formulate Traffic Management Plan. This should include the following: (i) Install traffic/warning signs like "safety first" at the construction area including fences or enclosures (ii) orient drivers to drive at low speeds, especially in market, school, hospital, urban areas. (iii) keep the roadway or bypass accessible to commuters to avoid traffic jam (iv) park at designated area (v) Detour road should be provided and accessible to commuters (vi) Temporary access of equipment and trucks must be established and approved by the sub-district officials.

111. A trained first aid personnel and health facility should be provided on site. Potable water and sanitary facilities should be provided to workers.



112. To prevent the transmission of HIV/AIDS, the contractor should incorporate on the health and safety plan the education of workers about sexually transmitted disease. These plans shall be provided to the client and client's consultant at the early stages of the project.

### **3. Environmental issues related to project operation**

#### **a) Traffic accident (D2)**

113. As a result of the reconstruction road, it will be possible for vehicle to increase its speed from an average of about 30 kph to possibly 100+ kph. This will consequently increase road accidents.

114. Below some measures to improve safety drive including:

- (i) Provide traffic signs on accident-prone points
- (ii) Public awareness and information campaign on traffic signs to educate communities on traffic.
- (iii) Roads and bridges should be regularly inspected and be maintained regularly.

### **4. Potential positive environmental and social impacts by the project**

#### **a) During project construction:**

115. **Livelihood/Income:** Increasing opportunities for local people to be employed as construction works. The construction contractor will be encouraged to maximize the employment of local people in the construction works. However, contractor should also provide enough training on safety work to them before starting works.

#### **b) During project operation:**

116. **Easier Transport at Reduced Costs (+D3):** The use of the new road will reduce travel time and transport costs. It will improve access to services, especially access to medical facilities, student go to school and other purposes.

117. **Livelihood/Income (+D3):** The improvement of the road will reduce cost for traveling and transporting of local products to market.

118. **Improved public access (+D3):** The improved road will provide benefits by improving road access to services by local communities, especially access to hospital, governmental services and markets.

Table 7: Environmental monitoring plan (EMoP)

Issue	Mitigation Measures (Items to Monitor)	Monitoring Required/Methods/Parameters	Schedule / Frequency	Start/ Completion Date	Reporting	Responsibility
<b>Pre-Construction Phase</b>						
Loss of trees	<ul style="list-style-type: none"> <li>Ensure that there are acceptable alternative borrow pit areas that would have an overall beneficial advantage in terms of improved livelihood and reduced environmental impact.</li> </ul>	Confirmed by MPWT-IA via note to file	Once during contract preparation	Before start of construction stage / Before end of design stage	Note to file regarding action(s) by MPWT-IA	DDIS Consultant, EA, IA
Damage to existing structures	<ul style="list-style-type: none"> <li>The design should maximize benefits or avoid impacts on assets. Resettlement framework for the Project and Cambodian laws, policies, and regulations should be complied with.</li> </ul>	Confirmed by MPWT-IA via note to file	Once during Contract preparation	Before start of Construction stage / Before end of design stage	Note to File regarding action(s) by MPWT-IA	DDIS Consultant, EA, IA
Possible accident due to risk of Land mine or UXO	<ul style="list-style-type: none"> <li>Consultative meetings with local communities are necessary to know clearly where there are risks of mines or UXO. Unsafe areas should be cleared before project implementation.</li> </ul>	Verify Information from local communities	Before the mobilization of contractor	Before the mobilization of contractor	Information from local communities	DDIS Consultant, EA, IA

Issue	Mitigation Measures (Items to Monitor)	Monitoring Required/Methods/Parameters	Schedule / Frequency	Start/ Completion Date	Reporting	Responsibility
<b>Construction Phase</b>						
Dust generation	<ul style="list-style-type: none"> <li>The Contractor will be required to formulate and implement a Dust Abatement Program that includes spraying of water on roads and work areas within villages close to the road.</li> <li>Vehicles transporting materials should be covered with tarpaulin or similar material</li> </ul>	<p>Check copy of the Dust Abatement Plan</p> <p>Check level of dust pollution by:</p> <ul style="list-style-type: none"> <li>-Aesthetics through visual observation</li> <li>-Feedback from village people</li> </ul>	Monthly	Start of Construction stage/Construction on stage	Proof that copies of the IEE/EMP are received by the contractor; Compliance monitoring reports	DDIS Consultant, EA, IA, Contractor's Safeguard Specialist (self monitoring)
Noise and vibration	<ul style="list-style-type: none"> <li>The Contractor should consider proper scheduling of construction activities particularly on sensitive areas. Acoustic barriers or enclosures for working areas should be provided.</li> </ul>	Feedback from village people about noise concern	Monthly	Construction stage	Compliance monitoring reports	DDIS Consultant, EA, IA, Contractor's Safeguard Specialist (self monitoring)
Generation of wastes	<p>Contractor should formulate and implement a Waste Management Plan. This should include:</p> <ul style="list-style-type: none"> <li>employ waste segregation (recyclables/biodegradable/re</li> </ul>	Check aesthetics through visual observation	Monthly	Construction stage	Compliance monitoring reports	DDIS Consultant, EA, IA, Contractor's Safeguard Specialist (self monitoring)

Issue	Mitigation Measures (Items to Monitor)	Monitoring Required/Methods/Parameters	Schedule / Frequency	Start/ Completion Date	Reporting	Responsibility
	<p>sidual wastes)</p> <ul style="list-style-type: none"> <li>designate an appropriate location as temporary staging area for excavated materials and other waste</li> <li>provide sufficient garbage containers in the construction camps and at work site</li> <li>regular disposal of wastes to an approved landfill or site should be implemented</li> <li>provide sanitary facilities for workers; this should be cleaned and maintained regularly</li> <li>Upon completion of construction works, camps and work sites used should be restored to its original or better condition.</li> </ul>					
Water contamination	<ul style="list-style-type: none"> <li>Waste/used oil should be collected, properly stored and disposed to an approved site</li> </ul>	Check copy of Spill Management Plan; records of waste/used oil	Monthly	Construction stage	Compliance monitoring reports	DDIS Consultant, EA, IA, Contractor's Safeguard

Issue	Mitigation Measures (Items to Monitor)	Monitoring Required/Methods/Parameters	Schedule / Frequency	Start/ Completion Date	Reporting	Responsibility
	<p>(according to national standard). Storage should be in drums raised off the ground and properly covered to keep rain water out. Lining or pan should be provided to contain any spills and simplify clean up.</p> <ul style="list-style-type: none"> <li>The Contractor shall prepare a Spill Management Plan (including measures to be taken and equipment to be used) to ensure adequate cleanup of any spills.</li> </ul>	<p>generated/ collected by licensed transporter-treater</p> <p>Visual inspection of waste/used oil in the storage area.</p> <p>Check of color of surface water traversed by the project through visual inspection.</p>				Specialist (self monitoring)
Water-borne disease	<ul style="list-style-type: none"> <li>Contractor must ensure that (i) solid wastes are regularly disposed into safe landfill</li> <li>Locate camps distant to communities</li> <li>Fill-up depressed areas to prevent water ponding which may be used as breeding ground for disease-carrying organisms mosquitoes</li> <li>Borrow pits may be utilized for aquaculture or be developed</li> </ul>	<p>Visual observation – stagnant water/water ponding due to construction.</p>	Monthly	Construction stage	Compliance monitoring reports	DDIS Consultant, EA, IA, Contractor's Safeguard Specialist (self monitoring)

Issue	Mitigation Measures (Items to Monitor)	Monitoring Required/Methods/Parameters	Schedule / Frequency	Start/ Completion Date	Reporting	Responsibility
	as water reservoir for community use.					
Water flow	<ul style="list-style-type: none"> <li>Do not water blockage</li> <li>Provide adequate cross drainage</li> </ul>	Visual observation – stagnant water flow	Monthly	Construction stage	Compliance monitoring reports	DDIS Consultant, EA, IA, Contractor's Safeguard Specialist (self monitoring)
Loss of agricultural land for borrow pits	<ul style="list-style-type: none"> <li>The contractor will use only licensed borrow operators. There will be no side borrow permitted, unless agreed to with roadside residents.</li> <li>The contractor will be responsible for rehabilitating any borrow sites opened and operated by them</li> </ul>	Check records on borrow sites; license of borrow pit operators; rehabilitation done; status of borrow sites used	Monthly	Construction stage	Compliance monitoring reports	DDIS Consultant, EA, IA, Contractor's Safeguard Specialist (self monitoring)
Loss of trees	<ul style="list-style-type: none"> <li>Tree clearing should be avoided as much as possible;</li> <li>The borrow pits will need to be re-vegetated before being handed back to the owner, or may be used for aquaculture.</li> </ul>	Visual observation, records of trees affected; Check tree planting plan	Monthly	Construction stage	Compliance monitoring reports	DDIS Consultant, EA, IA, Contractor's Safeguard Specialist (self monitoring)

Issue	Mitigation Measures (Items to Monitor)	Monitoring Required/Methods/Parameters	Schedule / Frequency	Start/ Completion Date	Reporting	Responsibility
	<ul style="list-style-type: none"> <li>Tree planting should be carried out in the appropriate location of the road. Coordinate with MoE regarding the species of trees to be used.</li> </ul>					
Soil erosion	<ul style="list-style-type: none"> <li>The contractor will be required to implement soil erosion control to minimize soil erosion and sedimentation of waterways. The alternative approaches should be: (1) provide adequate cross drainage to avoid over flow or flooding and (2) re-vegetation of erosion-prone areas</li> </ul>	<p>Visual observation of possible eroded segments.</p> <p>Visual observation on the possible change of color of surface water traversed by the project.</p>	Monthly	Construction stage	Compliance monitoring reports	DDIS Consultant, EA, IA, Contractor's Safeguard Specialist (self monitoring)
Traffic congestion, Safety and Health	<p>The Contractor should formulate and implement a Traffic Management Plan and Health and Safety Plan for the health and safety of the public and the workers as well.</p> <p>The plans should include the following:</p> <ul style="list-style-type: none"> <li>Install traffic/warning signs like "safety first" at the</li> </ul>	<p>Check copy of the Traffic Management Plan; Health and Safety Plan; accident records</p> <p>Visual observation – Safety signs installed, workers in PPE and without PPE; designated parking area,</p>				

Issue	Mitigation Measures (Items to Monitor)	Monitoring Required/Methods/Parameters	Schedule / Frequency	Start/ Completion Date	Reporting	Responsibility
	<p>construction area including fences or enclosures</p> <ul style="list-style-type: none"> <li>• orient drivers to drive at low speeds, especially in market, school, hospital, urban areas.</li> <li>• keep the roadway or bypass accessible to commuters to avoid traffic jam</li> <li>• park at designated area.</li> <li>• Detour road should be provided and accessible to commuters</li> <li>• Temporary access of equipment and trucks must be established and approved by the sub-district officials</li> <li>• Provide Protective Personal Equipment (PPE) to workers e.g. safety shoes, hardhats, earplugs, etc.</li> <li>• A trained first aid personnel and health facility should be provided on site.</li> <li>• Potable water and sanitary facilities should be provided to</li> </ul>	<p>potable water, sanitary facility, presence of first aid personnel, traffic condition, feedback from village people</p>				



Issue	Mitigation Measures (Items to Monitor)	Monitoring Required/Methods/Parameters	Schedule / Frequency	Start/ Completion Date	Reporting	Responsibility
	workers. • To prevent the transmission of HIV/AIDS, the contractor should incorporate on the health and safety plan the education of workers about sexually transmitted disease.					
Generation of employment particularly among women and unskilled people	• The contractor should comply with the Labor and Gender Action Plan ; employ people from villages including women and unskilled workers	Check reports/records on women/unskilled workers employed	Monthly	Construction stage	Compliance monitoring reports	DDIS Consultant, EA, IA, Contractor's Safeguard Specialist (self monitoring)
<b>Operation Phase</b>						
Traffic accident	• Provide traffic signs on accident-prone points especially near schools, hospitals and market areas. • Regular maintenance of road/bridges	Check traffic signs installed ; accident record	Annually	Operation stage	Compliance monitoring reports	EA, IA,

## VII. ANALYSIS OF ALTERNATIVES

119. Two (2) scenarios were considered on the analysis of alternatives for the project, these are:

- With the project (Reconstruction of roads on existing alignment),
- Without the project

120. Table 8 summarizes the rapid assessment done on the two (2) options in terms of environmental, social and economic considerations.

*Table 8: Rapid assessment of road reconstruction option*

Option	Environmental	Social	Economic
Reconstruction of road at existing location	<ul style="list-style-type: none"> <li>• Environmental impacts are confined to the existing corridor</li> <li>• Reduced of dust pollution</li> <li>• Improved aesthetics</li> </ul>	<ul style="list-style-type: none"> <li>• Reduced nuisance and health problems due to dust</li> <li>• Improved access to nearby communities served by the project</li> <li>• Improved road safety</li> </ul>	<ul style="list-style-type: none"> <li>• With moderate cost due to construction</li> <li>• With reduced travel time, travel cost is reduced, improved economy</li> </ul>
Without the project	<ul style="list-style-type: none"> <li>• No new disturbance but problems with the existing road/bridges in terms of safety will remain unresolved and could be aggravated due to increase in traffic volume and the possible flooding in rainy season</li> </ul>	<ul style="list-style-type: none"> <li>• Problems on health and safety, poor access to services, and socioeconomic condition will not improve</li> </ul>	<ul style="list-style-type: none"> <li>• No cost</li> <li>• No improvement in the economy</li> </ul>
HIGHEST RANKED OPTION	Reconstruction of road of existing location	Improve existing road condition and environmental issues in communities	Medium cost, but will provide great benefit for economic growth within the region

121. Based on assessment, the reconstruct of the existing road is the preferred option. This would resolve existing environmental and social issues associated with the present condition of such the structure. Also, it will provide a greater benefit to increase income in the community.

## VIII. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

122. MEF is the EA (executing agency) for the Project through its Project Coordination and Monitoring Unit (PCMU), which will be assisted by PCMU consultants. The PCMU has an Environment Focal Person to coordinate environmental and social safeguards planning and implementation, and these tasks will be assisted by the Safeguards Specialist in the PCMU consultant team. The PCMU will ensure that the respective IAs properly follow the IEEs and review framework (EARF) during subproject implementation. Three Project Implementation Units (PIUs) have been established in each of the IAs – MPWT, MRD, and MOWRAM. Each PIU has a Safeguards Focal Person, and they in turn will be supported by an Environment Specialist within the IA's consultant team. They will have the primary responsibility for disclosing information to the public and Affected Persons (APs).

123. The PIUs will undertake screening and classification of subprojects for submission to the PCMU and ADB. PIUs will prepare safeguards documents for approved subprojects. Safeguards documents will be reviewed and approved by the PCMU and ADB. PIUs will be tasked with the day-to-day implementation and monitoring of safeguards plans. PIUs will also obtain all clearances and fulfill government requirements. The PIUs will also have provincial offices with a Safeguards Coordinator who will be responsible for consulting with other Stakeholders, obtaining data required for safeguards plan preparation, monitoring and progress reports, and coordination with relevant departments such as department of environment to consult and/or obtain endorsement where necessary.

124. A series of public meetings with local authorities and people living within the project area have been conducted during the project development and design related to resettlement, design, environment and social factors, see in Figure 7. Furthermore the preparation of local community consultation should be continued for every stage of project design and implementation. Realistic impacts and issues will be updated and all impacts will be expediently mitigated. All such meetings encourage the full participation of the local communities. A list of participants attended the public meeting shows in Appendix 4.



Figure 7: Public meeting with people living within the project area

## IX. GRIEVANCE REDRESS MECHANISM

125. During site preparation and construction phases, there may have complaints related to the environmental performance of the project. To ensure that there will be a mechanism to resolve such complaints, the IAs shall undertake the following prior to the start of site works:

- Establish a grievance redress mechanism (GRM)
- Make public the existence of the GRM through public awareness campaigns; and
- Ensure that names and contact numbers of representatives of the IAs and contractors are placed on the notice boards outside the construction site and at local government offices (e.g., provincial and commune levels).

126. Through a Grievance Redress Committee (GRC), the concerns of affected people's can be promptly addressed, and complaints, and grievances about the project's environmental performance can be resolved at no cost to the complainant and without retribution. The GRC, which shall be established before commencement of site works, shall have members from the IAs (e.g. PDRD), commune councils, local NGO, and women's organizations. Grievances can be filed in writing or verbally with any member of the GRC. The committee will have 15 days to respond with a resolution. If unsatisfied with the decision, the existence of the GRC shall not impede the complainant's access to the Government's judicial or administrative remedies.

127. IAs shall make public the existence of this grievance redress mechanism through public awareness campaigns. They shall set-up a hotline for complaints and the hotline shall be publicized through the media and numbers placed on the notice boards outside the construction site and at local government offices (e.g., provincial, district, commune levels). Locally affected people will still be able to express grievances through the commune councils and these would be referred through the usual channels in those committees.

128. The GRC will receive, follow-up and prepare monthly reports on all complaints, disputes or questions received about the Project and corresponding actions taken to resolve the issues. The GRC will also use the punitive clauses of the 1996 Law on Environmental Protection and Natural Resources Management in conjunction with MOE to prosecute offending parties.

129. Villagers and APs are encouraged to voice complaints and these are to be duly investigated and reported through the contractor to the IA and so to MEF.

130. Environmental monitoring must be carried out by the construction supervision inspectors. Response to complaints will be based on the following schedule:

- Complaint made to contractor or others;
- Response by contractor or construction supervision consultants' inspectors;
- Weekly compiling of checklists by inspectors, with copies of checklists to be given to contractors as official notification of action being required, confirmation of receipt obtained by contractor signing copy, and joint inspection carried out if necessary;
- Monthly progress reports by inspectors by consolidating weekly reports;
- Corrective Action Reports (CARs) from contractors, as soon as action taken;

- Monthly progress meetings with contractors at which CARs from previous month examined and checked;
- Monthly progress reports to ADB detailing problems and Corrective Actions taken;
- Regular monitoring by the Local Environmental Specialist and semi-annual review by the International Environmental Specialist; and
- Confirmation with complainants that they are satisfied.

131. Review of progress must be checked on a daily basis by the inspectors. Any urgent issues must be drawn to the contractors' attention immediately. Failure by the contractor to respond in a timely or adequate manner must be raised with them at the monthly progress meetings.

132. The procedure is shown in Figure 8 below.

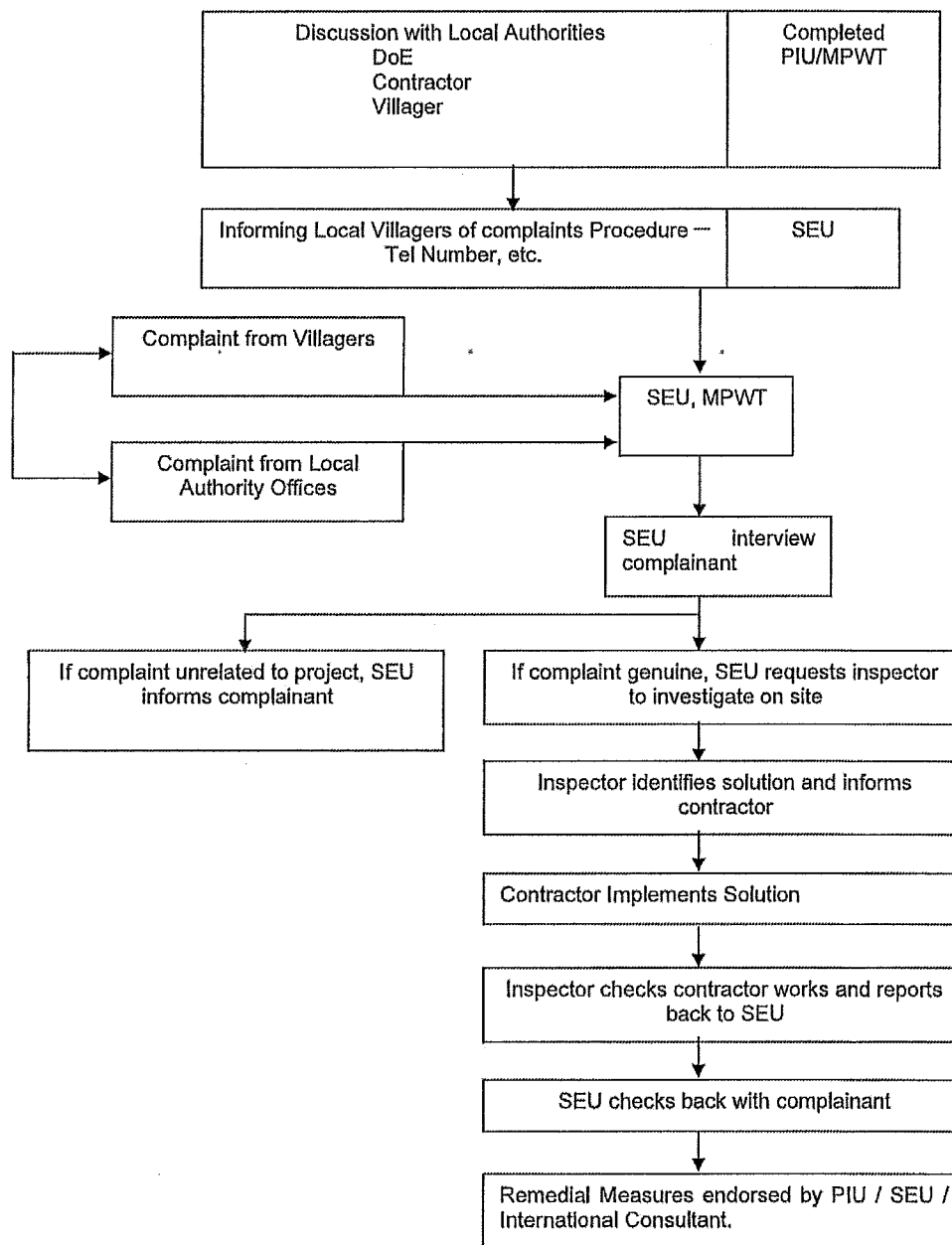


Figure 8: Investigation procedure

## X. ENVIRONMENTAL MANAGEMENT PLAN

133. The General Environmental Management Plan (EMP) gives guidance on how to mitigate the environmental concerns identified in connection with this project. The EMP deals with mitigation and management measures to be taken during Project implementation to avoid, reduce, and mitigate adverse environmental impacts.

134. IAs will ensure that the EMP is included in the tender documents for civil works. It will form part of the contract between the IA and the selected contractor and the requirements of the EMP will be contractually binding on the contractor. The conformity of contractors with environmental contract procedures and specifications shall be regularly monitored by the PCMU through the Social and Environmental Unit (SEU) during Project implementation. PCMU /SEU shall be assisted by the detailed design and implementation supervision consultant (DDIS) to undertake EMP monitoring and to prepare corresponding semi-annual reports for submission to ADB.

135. After appointment and mobilization the contractor must prepare his own version of the EMP known as the Contractors EMP (CEMP). This must give specific details of locations of borrow areas, borrow roads, workers camps and other facilities. This must be submitted to the Supervising Consultant for their approval before works commence.

136. The PCMU will monitor and measure the progress of EMP implementation. The monitoring activities will correspond with the project's risks and impacts and will be identified in the IEEs for subprojects. In addition to recording information of the work, deviation of work components from original scope, the PCMU will undertake site inspections and document review to verify compliance with the EMP and progress toward the final outcome.

137. Supervision consultants will submit monthly monitoring and implementation reports to the PIUs, who will take follow-up actions, if necessary. PIUs will submit quarterly monitoring and implementation reports to the PCMU. The PCMU will submit semi-annual monitoring reports to ADB. Project budgets will reflect the costs of monitoring and reporting requirements. Monitoring reports will be posted in a location accessible to the public. An example of Environmental and Social Monitoring Report Outline is given in **Appendix 2**.

138. The PCMU will document monitoring results, identify the necessary corrective actions, and reflect them in a corrective action plan. Each quarter the PCMU will study the compliance with the action plan developed in the previous quarter. Compliance with loan covenants will be screened by the EA.

139. ADB will review project performance against the EA's commitments as agreed in the legal documents. The extent of ADB's monitoring and supervision activities will be commensurate with the Project's risks and impacts. Monitoring and supervising of environmental safeguards will be integrated into the project performance management system. ADB will monitor projects on an ongoing basis until a project completion report is issued. ADB will carry out the following monitoring actions to supervise project implementation:

- conduct periodic site visits for projects with adverse environmental impacts;
- review the periodic monitoring reports submitted by the executing agency to ensure that adverse impacts and risks are mitigated as planned and as agreed with ADB;

- work with executing agency to rectify to the extent possible any failures to comply with their safeguard commitments, as covenanted in the legal agreements, and exercise remedies to re-establish compliance as appropriate; and
- prepare a project completion report that assesses whether the objective and desired outcomes of the safeguard plans have been achieved, taking into account the baseline conditions and the results of monitoring.

## **XI. CONCLUSION AND RECOMMENDATION**

140. Based on the study of the existing environmental and social conditions in the project areas and potential impacts from project implementation, it is found that the project will provide many benefits to communities in the project area in terms of improved livelihood and health, with reduced risk to life and properties. Travel will be safer, at lower cost and with less travel time, after the project is completed.

141. During the construction phase, a number of temporary negative impacts (e.g. dust, noise, vibration, reduced air quality, road safety, worker's safety, wastewater, solid waste, water contamination and traffic jam) will occur. However, those impacts can be minimized by the adoption of environmental control and mitigation measures.

142. To reduce impacts, the following approaches are recommended:

- The environmental mitigation measures and environmental monitoring and management plan, as presented in the IEE report and the EMP enclosed in the bid documents must be implemented.
- Good cooperation between all stakeholders, especially IA, EA and local authorities should be undertaken.
- Consultation with the local community should be implemented so that IAs can update concerns and issues during project construction and operation.
- Further investigations are needed with regard to developing a suitable design for the borrow pits so that these may provide a range of multiple uses for the villagers whose land has been excavated.

143. The IEE has identified a range of potential impacts and determined suitable mitigation measures together with a monitoring program. Implementation of the proposed mitigation measures, the monitoring program and recommendation will avoid/reduce the impacts to insignificant levels. Hence no detailed EIA study is required for this project.



## XII. APPENDICES

**Appendix 1: Annex of Sub-Decree No 72 ANRK. BK. Date 11 August 1999 (List of the Projects Require an IEIA or EIA)**

No.	Type and activities of the projects	Size / Capacity
<b>A</b>	<b>Industrial</b>	
<b>I</b>	<b>Foods, Drinks, Tobacco</b>	
1.	Food processing and caned	≥ 500 Tones/year
2.	All fruit drinks manufacturing	≥ 1,500 Litres / day
3.	Fruit manufacturing	≥ 500 ones/year
4.	Orange Juice manufacturing	All sizes
5.	Wine manufacturing	All sizes
6.	Alcohol and Beer brewery	All sizes
7.	Water supply	≥ 10,000 Users
8.	Tobacco manufacturing	≥ 10,000 Boxes/day
9.	Tobacco leave processing	≥ 350 Tones/ year
10.	Sugar refinery	≥ 3,000 Tones / year
11.	Rice mill and cereal grains	≥ 3,000 Tones / year
12.	Fish, soy bean, chili, tomato sources	≥ 500,000 Litres/ year
<b>II.</b>	<b>Leather tanning, Garment and Textile</b>	
1.	Textile and dyeing factory	All sizes
2.	Garments, washing, printing, dyeing	All sizes
3.	Leather tanning, and glue	All sizes
4.	Sponge- rubber factory	All sizes
<b>III.</b>	<b>Wooden production</b>	
1.	Plywood	≥ 100,000m <sup>3</sup> /year(log)
2.	Artificial wood	≥ 1,000 m <sup>3</sup> /year (log)
3.	Saw mill	≥ 50,000m <sup>3</sup> /year (log)
<b>IV.</b>	<b>Paper</b>	

No.	Type and activities of the projects	Size / Capacity
1.	Paper factory	All sizes
2.	Pulp and paper processing	All sizes
<b>V.</b>	<b>Plastic, Rubber and Chemical</b>	
1.	Plastic factory	All sizes
2.	Tire factory	≥ 500 Tones /year
3.	Rubber factory	≥ 1,000 Tones /year
4.	Battery industry	All sizes
5.	Chemical production industries	All sizes
6.	Chemical fertilizer plants	≥ 10,000 Tones /year
7.	Pesticide industry	All sizes
8.	Painting manufacturing	All sizes
9.	Fuel chemical	All sizes
10.	Liquid, powder, solid soaps manufacturing	All sizes
<b>VI</b>	<b><i>Mining production other than metal</i></b>	
1.	Cement industry	All sizes
2.	Oil refinery	All sizes
3.	Gas factory	All sizes
4.	Construction of oil and gas pipeline	≥ 2 Kilometres
5.	Oil and gas separation and storage facilities	≥ 1,000,000 Litres
6.	Fuel stations	≥ 20,000 Litres
7.	Mining	All sizes
8.	Glass and bottle factory	All sizes
9.	Bricks, roofing tile manufacturing	150,000 piece /month
10.	Flooring tile manufacturing	90,000 piece /month
11.	Calcium carbide plants	All sizes
12.	Producing of construction materials(Cement)	900 tones/month

No.	Type and activities of the projects	Size / Capacity
13.	Cow oil and motor oil manufacturing	All sizes
14.	Petroleum study research	All sizes
<b>VII</b>	<b><i>Metal industries</i></b>	
1.	Mechanical industries	All sizes
2.	Mechanical storage factory	All sizes
3.	Mechanical and shipyard enterprise	All sizes
<b>VIII</b>	<b><i>Metal Processing Industrials</i></b>	
1.	Manufacturing of harms, barbed wires, nets	≥ 300 Tones/month
2.	Steel mill, Irons, Aluminum	All sizes
3.	All kind of smelting	All sizes
<b>IX</b>	<b><i>Other Industries</i></b>	
1.	Waste processing, burning	All sizes
2.	Waste water treatment plants	All sizes
3.	Power plants	≥ 5 MW
4.	Hydropower	≥ 1 MW
5.	Cotton manufacturing	≥ 15 Tones/month
6.	Animal's food processing	≥ 10,000 Tones/year
<b>B.</b>	<b>AGRICULTURE</b>	
1.	Concession forest	≥ 10,000 Hectares
2.	Logging	≥ 500 Hectares
3.	Land covered by forest	≥ 500 Hectares
4.	Agriculture and agro-industrial land	≥ 10,000 Hectares
5.	Flooded and coastal forests	All sizes
6.	Irrigation systems	≥ 5,000 Hectares
7.	Drainage systems	≥ 5,000 Hectares
8.	Fishing ports	All sizes

No.	Type and activities of the projects	Size / Capacity
<b>C. TOURISM</b>		
1.	Tourism areas	≥ 50 Hectares
2.	Golf field	≥ 18 Holes
<b>D. INFRASTRUCTURE</b>		
1.	Urbanization development	All sizes
2.	Industrial zones	All sizes
3.	Construction of bridge-roads	≥ 30 Tones weight
4.	Buildings	Height ≥ 12 m or floor ≥ 8,000 m <sup>2</sup>
5.	Restaurants	≥ 500 Seats
6.	Hotels	≥ 60 Rooms
7.	Hotel adjacent to coastal area	≥ 40 Rooms
8.	National road construction	≥ 100 Kilometres
9.	Railway construction	All sizes
10.	Port construction	All sizes
11.	Airport construction	All sizes
12.	Dredging	≥ 50,000 m <sup>3</sup>
13.	Dumping site	≥ 200,000 people

## ***Appendix 2: Environmental and Social Monitoring Report Outline***

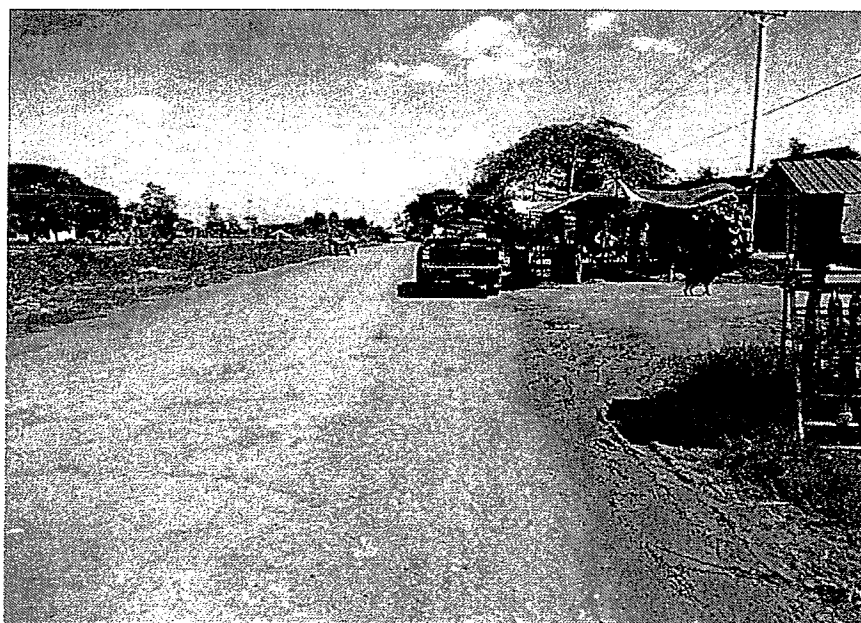
The level of detail and comprehensiveness of a monitoring report is commensurate with the complexity and significance of social and environmental impacts. A safeguard monitoring report may include the following elements:

- Background/context of the monitoring report (adequate information on the project, including physical progress of project activities, scope of monitoring report, reporting period, and the monitoring requirements including frequency of submission as agreed upon);
- Changes in project scope and adjusted safeguard measures, if applicable;
- Qualitative and quantitative monitoring data;
- Monitoring parameters/indicators and methods based on the monitoring plan/program previously agreed upon with ADB;
- Monitoring results compared against previously established benchmarks and compliance status (e.g., national environmental emission and ambient standards and/or standards set out in the Bank Group's Environmental, Health and Safety Guidelines; timeliness and adequacy of environmental mitigation measures; involuntary resettlement compensation rates and timeliness of payments, adequacy and timeliness of involuntary resettlement rehabilitation measures including serviced housing sites, house reconstruction, livelihood support measures, and training; budget for implementing environment management plan (EMP), resettlement plan, or indigenous people plan, timeliness and adequacy of capacity building, etc.);
- Monitoring results compared against the objectives of safeguards or desired outcomes documented (e.g. involuntary resettlement impacts avoided or minimized; livelihood restored or enhanced; indigenous people (IP's) identity, human right, livelihood systems and cultural uniqueness fully respected; indigenous people not suffer adverse impacts, environmental impacts avoided or minimized, etc.);
- If noncompliance or any major gaps identified, include a corrective action plan;
- Records on disclosure of monitoring information to affected communities;
- Identification of key issues, or complaints from affected people, or recommendations for improvement;
- Monitoring adjustment measures recommended based on monitoring experience/trends and stakeholders response;
- Information about actual institutional arrangement for implementing the monitoring program/plan provided or adjusted, as may be required;
- Proposed items of focus for the next report and due date.

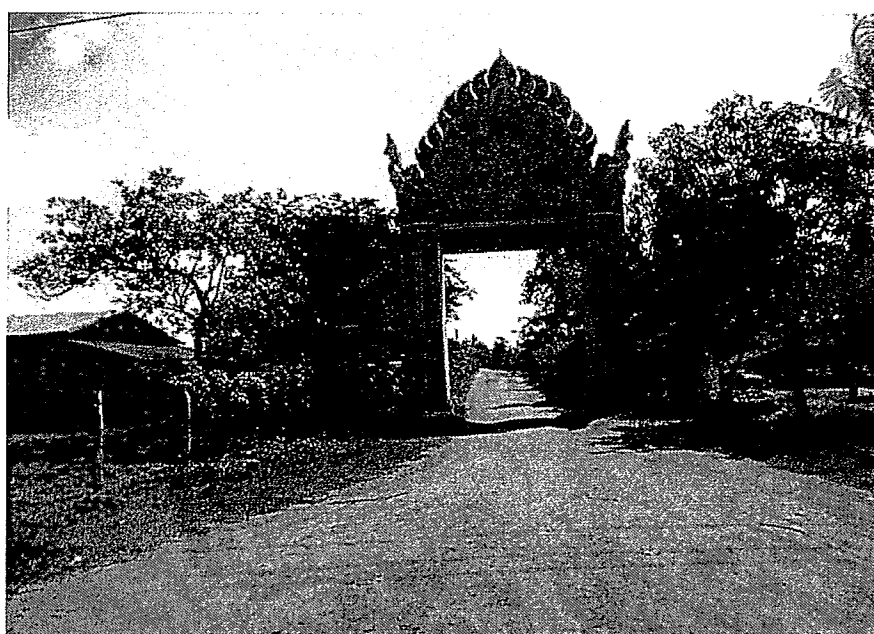
**Appendix 3: Photos**



Existing road will be replaced to Laterite road of PR 1570 at Battambang Province



Small business shops along the PR 1570



Pagoda located along the PR 1570

**Appendix 4: List of participants attended the public meeting**



KINGDOM OF CAMBODIA  
Ministry of Public Works and Transport (MPWT)  
Flood Damage Emergency Reconstruction Project (FDERP)  
Grant No. 0285-CAM (EF) and Loan No.3125-CAM (SF)

**ATTENDANCE SHEET**

Subject: ប្រជុំព្រឹត្តិការណ៍សាងសង់: ផែនការស្តារកម្មស្រូវ (ក្រសួងសាងសង់សាងសង់)

Date/Time: 19 / កក្កដា / 2014

Venue: ភ្នំពេញ

No.	Name ឈ្មោះ	Position តំណែង	Sex ភេទ	Organization អង្គភាព	E-mail / Tel.	Signature ហត្ថលេខា
1	ស៊ី ឡាន ហ៊ុន	អគ្គនាយក	ប្រុស	អង្គការស្រូវ	017285356	[Signature]
2	គី ឡាន ហ៊ុន	អគ្គនាយក	ប្រុស	អង្គការស្រូវ	095668348	[Signature]
3	គី ឡាន ហ៊ុន	អគ្គនាយក	ប្រុស	អង្គការស្រូវ	095668348	[Signature]
4	គី ឡាន ហ៊ុន	អគ្គនាយក	ប្រុស	អង្គការស្រូវ		[Signature]
5	គី ឡាន ហ៊ុន	អគ្គនាយក	ប្រុស	អង្គការស្រូវ		[Signature]
6	គី ឡាន ហ៊ុន	អគ្គនាយក	ប្រុស	អង្គការស្រូវ		[Signature]
7	គី ឡាន ហ៊ុន	អគ្គនាយក	ប្រុស	អង្គការស្រូវ		[Signature]
8	គី ឡាន ហ៊ុន	អគ្គនាយក	ប្រុស	អង្គការស្រូវ	0977004594	[Signature]
9	គី ឡាន ហ៊ុន	អគ្គនាយក	ប្រុស	អង្គការស្រូវ		[Signature]
10	គី ឡាន ហ៊ុន	អគ្គនាយក	ប្រុស	អង្គការស្រូវ		[Signature]
11	គី ឡាន ហ៊ុន	អគ្គនាយក	ប្រុស	អង្គការស្រូវ		[Signature]
12	គី ឡាន ហ៊ុន	អគ្គនាយក	ប្រុស	អង្គការស្រូវ		[Signature]
13	គី ឡាន ហ៊ុន	អគ្គនាយក	ប្រុស	អង្គការស្រូវ		[Signature]
14	គី ឡាន ហ៊ុន	អគ្គនាយក	ប្រុស	អង្គការស្រូវ		[Signature]
15	គី ឡាន ហ៊ុន	អគ្គនាយក	ប្រុស	អង្គការស្រូវ		[Signature]





KINGDOM OF CAMBODIA  
Ministry of Public Works and Transport (MPWT)  
Flood Damage Emergency Reconstruction Project (FDERP)  
Grant No. 0285-CAM (EF) and Loan No.3125-CAM (SF)

ATTENDANCE SHEET

Subject: ប្រជុំការងារ (គណៈកម្មាធិការ)

Date/Time: 19 / កក្កដា / 2014

Venue: អគ្គនាយកដ្ឋាន

No.	Name ឈ្មោះ	Position តំណែង	Sex ភេទ	Organization អង្គភាព	E-mail / Tel.	Signature ហត្ថលេខា
1	ឧបនាយករដ្ឋមន្ត្រី	នាយក	ប្រុស	រដ្ឋសភា		
2	លោក ហង់ ជួន	—	ប្រុស	—		
3	លោក ហង់ ជួន	—	ប្រុស	—		
4	លោក ហង់ ជួន	—	ប្រុស	—		
5	លោក ហង់ ជួន	—	ប្រុស	—		
6	លោក ហង់ ជួន	—	ប្រុស	—		
7	លោក ហង់ ជួន	—	ប្រុស	—		
8	លោក ហង់ ជួន	—	ប្រុស	—		
9	លោក ហង់ ជួន	—	ប្រុស	—		
10	លោក ហង់ ជួន	—	ប្រុស	—		
11	លោក ហង់ ជួន	—	ប្រុស	—		
12	លោក ហង់ ជួន	—	ប្រុស	—		
13	លោក ហង់ ជួន	—	ប្រុស	—		
14	លោក ហង់ ជួន	—	ប្រុស	—		
15	លោក ហង់ ជួន	—	ប្រុស	—		



KINGDOM OF CAMBODIA  
Ministry of Public Works and Transport (MPWT)  
Flood Damage Emergency Reconstruction Project (FDERP)  
Grant No. 0285-CAM (EF) and Loan No.3125-CAM (SF)

ATTENDANCE SHEET

Subject: បង្កើនសុវត្ថិភាពរថភ្លើង

Date/ Time: 19/ ឧសភា/ 2014

Venue: ក្រុមការងារបង្កើនសុវត្ថិភាពរថភ្លើង

No.	Name ឈ្មោះ	Position តំណែង	Sex ភេទ	Organization អង្គការ	E-mail / Tel.	Signature
1	លោក ហ៊ុន សែន	ប្រធាន	ប្រ.	MPWT		
2	លោក ហ៊ុន សែន	ប្រធាន	ប្រ.			
3	លោក ហ៊ុន សែន		ប្រ.			
4	លោក ហ៊ុន សែន		ប្រ.			
5	លោក ហ៊ុន សែន		ប្រ.			
6	លោក ហ៊ុន សែន		ប្រ.			
7	លោក ហ៊ុន សែន		ប្រ.			
8	លោក ហ៊ុន សែន		ប្រ.			
9	លោក ហ៊ុន សែន		ប្រ.			
10	លោក ហ៊ុន សែន		ប្រ.			
11	លោក ហ៊ុន សែន		ប្រ.			
12	លោក ហ៊ុន សែន		ប្រ.			
13	លោក ហ៊ុន សែន		ប្រ.			
14	លោក ហ៊ុន សែន		ប្រ.			
15	លោក ហ៊ុន សែន		ប្រ.			

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