

Initial Environmental Examination

July 2012

Cambodia: Flood Damage Emergency Reconstruction Project

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

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KINGDOM OF CAMBODIA
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MINISTRY OF PUBLIC WORKS AND TRANSPORT

ASIAN DEVELOPMENT BANK

Project Number: 46009

Cambodia:
Flood Damage Emergency Reconstruction Project (FDERP)
Stage 2 Sub-Project (CW1, CW2 & CW3)

INITIAL ENVIRONMENTAL EXAMINATION REPORT

Ministry of Public Work and Transport

Phnom Penh, July 2012

ABBRAVIATION

AADT	Annual Average Daily Traffic
ADB	Asian Development Bank
APL	Angkor Protected Landscape
APSARA	Authority for Protection and Management of Angkor and the Region of Siem Reap
BOD	Biological Oxygen Demand
BTB	Battambang
DBST	Double Bituminous Surface Treatment
DoE	Department of Environment
EA	Executing Agency
EARF	Environmental Assessment and Review Framework
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMoP	Environmental Monitoring Plan
FDERP	Flood Damage Emergency Reconstruction Project
FS	Feasibility Study
GoC	Government of Cambodia
GPS	Global Positioning System
GRM	Grievance Redress Mechanism
ha	Hectare
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
IA	Implementing Agency
IEE	Initial Environmental Examination
MAG	Mines Advisory Group
MCFA	Ministry of Culture and Fine Arts
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
MT	Motorized Transport
NR	National Road
NTFP	Non-Timber Forest Products
O&M	Operation and Maintenance
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
RCVIS	Road Crash and Victim Information System
REA	Rapid Environmental Assessment
RI	Riel
ROW	Right of Way
RP	Resettlement Plan
SBST	Single Bituminous Surface Treatment
SEIA	Summary Environmental Impact Assessment
SEU	Social and Environmental Unit
SPS	ADB's Safeguard Policy Statement (2009)
TA	Technical Assistance
TSBR	Tonle Sap Biosphere Reserve
TSP	Total Suspended Particulates
UNESCO	United Nations Educational Scientific and Cultural Organization
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 (FDERP), with the funding through a loan from the ADB and grant from the Australian Government. The project which was divided into three (3) Outputs aims to restore and reestablish the use of flood-damaged infrastructures. 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. Stage 2 Subprojects of 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 document covers CW1 - Emergency Reconstruction of 2-km Detour Road in Prey Veng City; CW2 - Emergency Reconstruction of Baray Lex Bridge at PK 88+900 near Prey Veng City Prey Veng Province, and ; CW3 - Emergency Reconstruction of Koh Rokar Bridge, Kampong Cham Province.

3. Review of project-related reports, gathering of secondary data, site inspection and interview of stakeholders were performed. Impacts and corresponding mitigation measures were identified. The assessment also covers the verification if any supplementary study is required.

4. Based on the assessments made, some of the negative impacts expected are dust, noise, hazards, including generation of solid wastes and wastewater. These impacts are short term and insignificant with the timely and efficient implementation of mitigation measures..

5. During operation phase of the project, on the other hand, implementation of the project will result to significant social benefits. Among the advantages that can be realized by the recipient of the project are reduced risk to life and properties caused by floods, improved livelihood, less travel time and more economical. Nuisance caused by laterite dust will be minimized.

6. Some recommended approaches that can be implemented to avoid or reduce the negative impacts are presented below:

- The environmental mitigation measures and environmental monitoring plan which are presented in the IEE report should be implemented.
- Promote good cooperation among stakeholders, especially among IA, EA and local authorities.
- Consultation with the local communities should be undertaken by the IAs to update them of the 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 lot owners.

II. POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

A. Policy Framework

7. 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 23rd November 1993.

8. 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

9. 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

10. 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.

11. 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

12. 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

13. 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

14. 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

15. 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.

16. 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 if a regulation is complied or not. 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

17. 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/m³ 24 hour average should be met. All vehicles should be well maintained and comply with the air quality regulations.

(2) Noise

18. 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)

19. "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

20. 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)

21. As a minimum, all discharges of liquid wastes from construction camps, work sites or operations, to streams or water courses should be: BOD ≤ 50 mg/L; Turbidity < 5 NTU; SS ≤ 50 mg/L; Temperature $< 45^{\circ}\text{C}$; pH = 6-9; Oil & Grease ≤ 5 mg/L and Dissolved Oxygen > 4 mg/L.

22. 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)

23. 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.

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

e) Hazardous Substances

25. 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

1. Protected Areas

26. 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.

27. 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

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.

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

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

30. 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. Cambodian IEE Requirements

31. 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**)

32. 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 ≥ 100 Kilometers and bridges ≥ 30 tonnes”. As this project is rehabilitation of existing roads, and bridges are 25 tonnes capacity, an IEE will not be required by MoE.

III. DESCRIPTION OF PROJECT

33. National and provincial road restoration (Output 1) will reconstruct flood damaged national and provincial roads in four provinces. In Prey Veng, 2 kilometers (km) of ring road, which also serves as a flood protection dyke for Prey Veng City will be strengthened, and 5 bridges along National Road 11 which were severely weakened by the floods will be replaced. In Kampong Cham (PR270), Banteay Meanchey and Battambang Provinces (PR159B&C), 72 km of provincial roads will be repaired and upgraded, and one bridge replaced

34. Brief description of subprojects under Stage 2 of Output 1 is presented below:

35. **CW1: Dyke/ Detour road and Krong Prey Veng Bridge on NR11** - The embankment of the existing dyke will be widened and raised. Geotextile will be laid in and on the embankment to protect the slope and waterproofing of the dyke from adjacent floodwater and slopes will be planted with grass.

36. The bridge will be constructed in PK 88+900. It will be 2-lane with an over-all length of 67.7 m. It will have piled foundation, reinforced Concrete (RC) substructure, box beams set on crossheads and on abutments as superstructure.

37. **CW2: Baray Lex bridge on NR11 (PK: 88+900)**- Baray Lex will be reconstructed online at PK 8+000; 2-lane wide deck with shoulders. It will have pile foundations, Reinforced Concrete (RC) substructure, box beams set on crossheads and on abutments as superstructure. It will have short lengths of widened/heightened road on either side to match new bridge deck level and location back to the existing road section. This will involve some earthworks and paving with asphalt concrete. Slope and under bridge protection will be provided, in the form of gabions and similar devices in selected sections.

38. Detour road will be provided during construction. This will be constructed within government-owned property. The embankments will be supported with sandbags and will have approximately 50 m Bailey bridge.

39. **CW3: Koh Roka Bridge on PR270 at Kampong Cham Province** - The new 2 lane bridge will be constructed in its existing location. It has an overall length of 45 m, the bridge will have deep pile foundations, reinforced concrete substructure, box beams set on crossheads and on abutments as superstructure. It will have short lengths of widened/heightened road on either side to match new bridge deck level and location back to the existing road section. This will involve some earthworks and paving with asphalt concrete. Slope and under bridge protection will be provided in selected sections.

40. A detour road will be provided during construction. This will be constructed within government-owned property.

41. Presented below are the Location Maps and Project Layouts of CW1, CW2 and CW3.

Location Maps

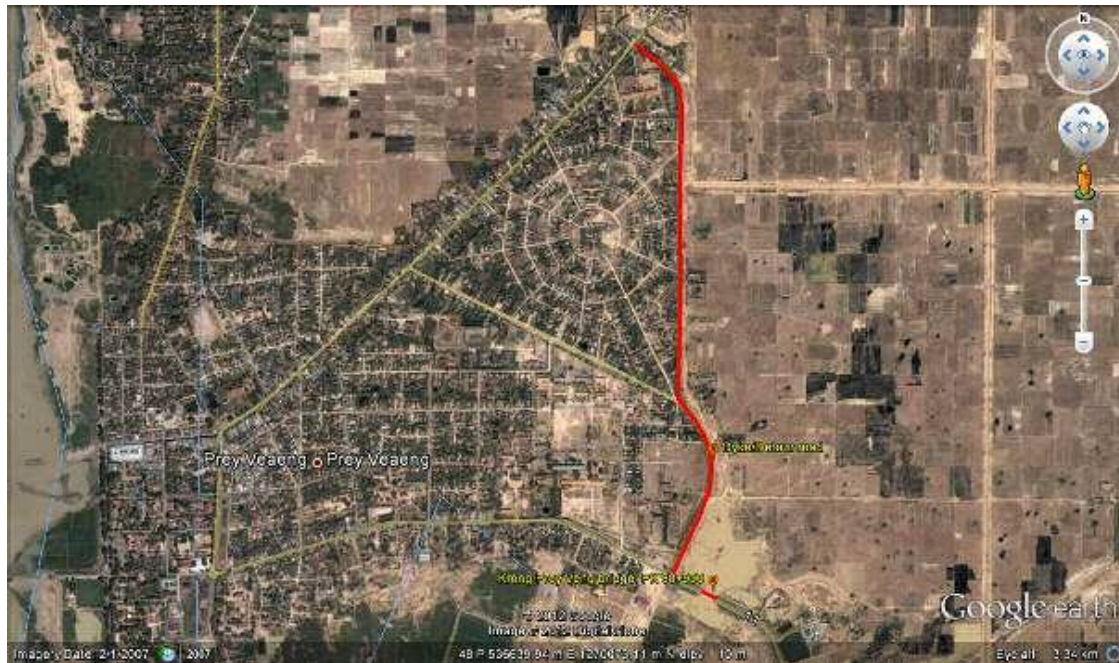


Figure 1: CW1: Dyke/ Detour road and Krong Prey Veng Bridge on NR11, Prey Veng Province



Figure 2: CW2: Baray Lex bridge on NR11 (PK: 88+900), Prey Veng Province



Figure 3: CW3: Koh Roka Bridge on PR270 at Kampong Cham Province, Kampong Cham Province

IV. DESCRIPTION OF THE ENVIRONMENT

A. Physical environment

1. Topography, geology and soil

42. Cambodia is bounded by Thailand to the northwest, Laos to the northeast, and Vietnam to the east, and the Gulf of Thailand to the southwest. It has twenty four (24) provinces and capital city. The provinces covered by the project are Battambang, Banteay Meanchey, Siem Reap, Kampong Cham, Prey Veng and Kampong Thom. These are located in floodplain of the lower Mekong River Basin in Cambodia.

☆ 43. 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.

44. The geology of the Battambang, Banteay Meanchey and Prey Veng areas is characterized by young alluvium soils (see Geological Map in **Figure 1** 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).

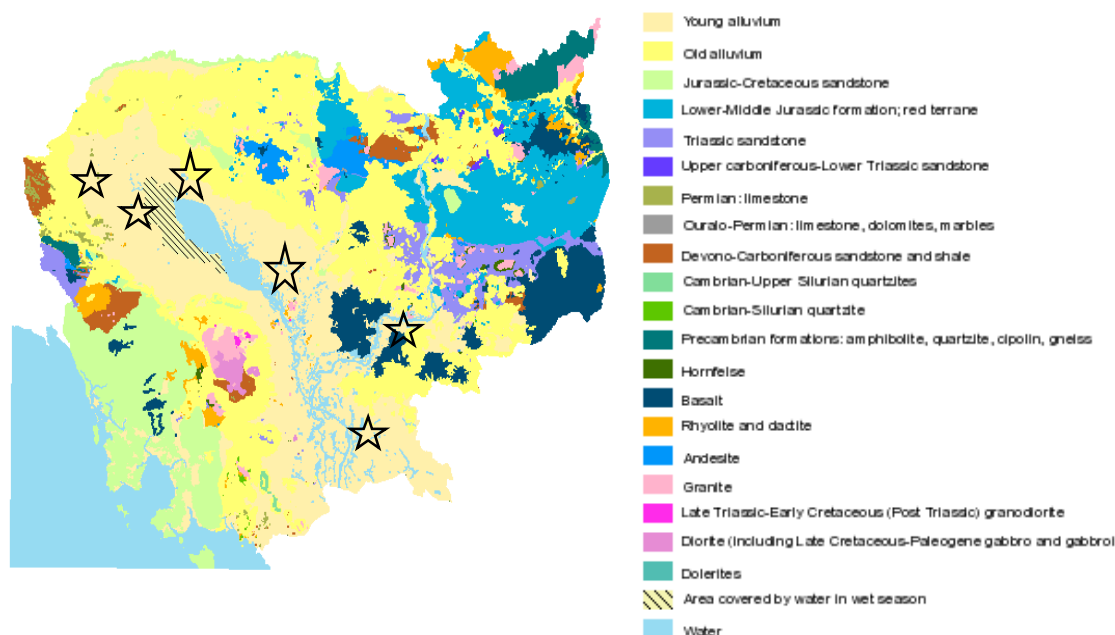


Figure 4: Geological Map

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

45. 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.

46. As to dominant land use, rice fields surround the project area.

2. Climate

47. The climate in the project area is characteristic of the Mekong River basin and is dominated by two monsoons from the southwest and northeast. The southwest monsoon from May to October brings heavy and frequent rains and high humidity. The northeast monsoon from November to May brings little precipitation and low humidity. The hottest month in the project area is April with an average temperature of 35.2°C and the coldest month is January with an average temperature of 21.8°C. Average relative humidity is 73% in the dry season and rises to 85% in the wet season. Average annual precipitation is 1700mm, with over 70% of rainfall experienced between May and October

3. Air quality

48. Air quality monitoring data is unavailable for this project area as well as for Prey Veng 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 Study Area

DATE	NO ₂ (µg/m ³)	SO ₂ (µg/m ³)	CO (mg/m ³)	TSP (mg/m ³)	Pb (µg/m ³)
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

49. 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.

50. 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.

4. Water Resources

51. According to the GMS (2002), the hydrology of the project area, especially Battambang and Banteay Meanchey, is determined by three systems: (i) the hydrological conditions that prevail in the upper catchment areas of the Dangrek escarpment as modified by the nearly level plain area that surrounds the road and is evident as channelised flow in the four main drainage channels that cross the plains area, (ii) locally derived drainage that originates from the plain as overland flow. This becomes channelised below the road and then joins one of watercourses and enters the Tonle Sap via the Stung Sangkae, and (iii) the operation of the Tonle Sap itself. The Tonle Sap is the largest freshwater area in SE Asia and is an important regulating feature of the lower Mekong River, which serves as catch basin; both moderates flood flows during the wet season and maintains low flows during the dry season.

52. As for Prey Veng and Kampong Cham, the hydrology of the area is affected by two main systems: (i) locally derived drainage from its plain and catchment, and (ii) the natural flowing and drainage from the lower Mekong River.

5. Surface Water Quality

53. Surface water in the project area is generally used for irrigation purposes and domestic use. The emergency reconstruction of bridges will play an important role in releasing water from Mekong river down to two (2) main natural wetland areas at the western and eastern part of the project area. One wetland is located approximately 1 km west of the beginning of the project while and the second wetland is located approximately 3.5 km east of the beginning of the project known as Boeung Pring. During the wet season, both wetlands expand where run-off is conveyed.

54. There is no information on water quality of surface water in 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

PARAMETER	CAMBODIAN NATIONAL STANDARD
pH	6.5 to 8.5
Turbidity	-
Total coliforms (MPN/100mL)	< 5000
TSS (mg/L)	25-100
BOD ₅ (mg/L)	1-10

6. Groundwater

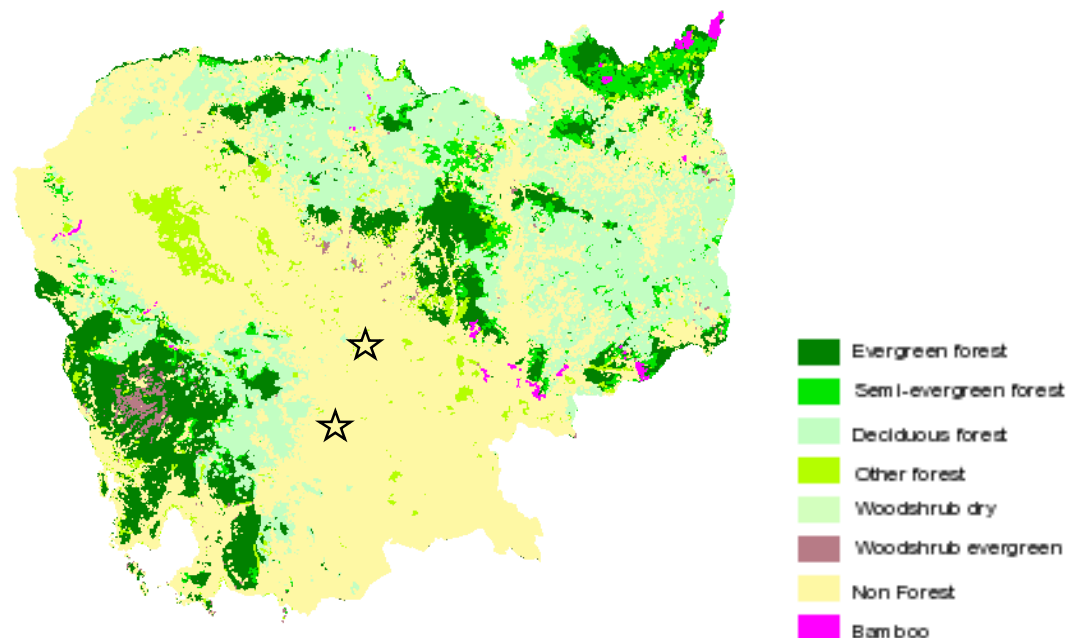
55. Groundwater is used by the local people both for domestic and commercial uses. Based on interview, water quality and quantity are affected during dry season. Monitoring of volume and quality, however, has not been undertaken in the project area.

B. Biological Environment

1. Forest and vegetation

56. The natural forest in the project area has been converted into agricultural lands as shown in **Figure 3**. Common vegetations 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 Cover Map



Source: CTD, 2012

2. Protected areas

57. There are no protected areas in the vicinity of the project or within the 3 km radius of the site. Protected Areas in Cambodia is managed by the Ministry of Environment (MOE). Twenty-three (23) protected and wildlife conservation areas were proclaimed in 1993. These are located in Battambang (**Table 3**). There were no protected areas proclaimed in Prey Veng, Banteay Meanchey and Kampong Cham in 1993 (Table 1). According to the GMS (2002), additional protected areas were proclaimed in Banteay Meanchey (**Table 4**).

58. Referring to the Royal Decree on the creation and designation of protected areas (1993), these protected areas cover 3,273,200 ha, approximately 18% of the country's land area. This is under the direct legal framework of the new Protected Areas Law promulgated in February 2008.

Table 3: Description of the protected areas administrated by the MOE

Protected area	Surface area (ha)	Province
Natural Parks: 871,250 ha		
Bokor	140,000	Kampot
BotumSakor	171,250	Koh Kong
Kep	5,000	Kep
Kirirum	35,000	Kampong Speu and Koh Kong
Phnom Kulen	37,500	Siem Reap

Protected area	Surface area (ha)	Province
Ream	150,000	Sihanouk-Ville
Virachey	332,500	StuengTreng and Rattanakiri.
Wildlife Preserves: 2,030,000 ha		
Boeng Per	242,500	Kampong Thom
KulenPromtep	402,500	Siem Reap, OddorMeanchey and PreahVihear
Lumphat	250,000	Rattanakiri and Mondulkiri.
PeamKrasoab	23,750	Koh Kong
Phnom Namlear	47,500	Mondulkiri
Phnom Oral	253,750	Koh Kong, Pursat and Kampong Chhnang
Phnom Prich	222,500	Mondulkiri and Kratie
Phnom Samkos	333,750	Koh Kong and Pursat
RoneamDonsam	178,750	Battambang
Snoul	75,000	Kratie
Protected scenic view areas: 500,950 ha		
Angkor	10,800	Siem Reap
BanteayChmar	81,200	BanteayMeanchey
Dung Peng	27,700	Koh Kong
PreahVihear	5,000	PreahVihear
Samlot	60,000	Battambang
Tonle Sap	316,250	Kampong Chhnang, Kampong Thom, Siem Reap, Battambang and Pursat.

Source: Royal decree on the creation and designation of protected areas (1993)

Table 4: Protected Areas in the Province of Banteay Meanchey and Battambang

Protected Area	Province	Total Size (ha)	Characteristics
AngTrapangThmorSarus Crane Conservation Area	BanteayMeanchey	12,650	Important site for the Eastern Sarus Crane and other water fowl that have established a habitat on the reservoir.

RonemDaun Sam Wildlife Sanctuary	BanteayMeanchey 30% Battambang 70%	178,750	Lowland evergreen and semi-evergreen forest of unknown condition – no forest exists across the Thai border. Possibly holds pileated gibbon (an endangered primate).
BanteayChhmar Protected Landscape	BanteayMeanchey	81,200	The area contains archaeological/cultural value. Otherwise the area is reported to be badly degraded.

(**Source:** National Environmental Action Plan, MoE, 1998, Tonle Sap Resource Management and Conservation,

CNMC, 2001, Conservation Activities at AngTrapeangThmorSarus Crane Conservation Area, WCS, 2001.)

3. Wildlife and Endangered Species

59. 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 on the site.

4. Aquatic Resources

60. Fish production of the Tonle Sap Lake is estimated about 65kg per hectare per year, which is more than five times that of most tropical freshwater bodies (World Bank, 2003). According to the GMS (2002) the most common fish has been found in the Lake and flood plain areas presented in the **Table 3**.

61. For water bodies traversed by the subprojects, the water is intermittent. During rainy season, it is expected that some aquatic species like fish, crab, shrimp, snails and amphibians will be present in the project area. There was no survey on aquatic resources done in the project site.

Table 5: Fish commonly found in the Tonle Sap and Floodplain area

Local Name	Scientific Name	Comments
TreiRos/ Ptuok	<i>Channa striata</i>	Migrates for breeding
TreiAndengTun	<i>Clarias macrocephalus</i>	Migrates for breeding
TreiChhpin	<i>Barbodes gonionotus</i>	
Trei Riel	<i>Henicorhynchus siamensis</i>	
Chhlang	<i>Mystus filamentus</i>	
TreiKes	<i>Micronema bleekeri</i>	
TreiKagnchruk	<i>Botia modesta</i>	

TreiKamphleanh	<i>Trichogastertrichopterus</i>	Migrates for breeding
TreiKamphleav	<i>Kryptopterusmoorei</i>	Migrates for breeding
KanhChanhChras	<i>Pseudambassisnotatus</i>	
KanhChos	<i>Mystusmysticetus</i>	Migrates for breeding
KanTrob	<i>Pristolepisfasciata</i>	
KhongVeng	<i>Dangilalineata</i>	Migrates for breeding
Kranh	<i>Anabas testudineus</i>	Migrates for breeding
Krosphnom	<i>Poropuntiusdeauratus</i>	Migrates for breeding
AngkatPrak	<i>Cyclocheilichthysmicrolepis</i>	
Slat	<i>Notopterusnotopterus</i>	
Ta Aun/ Kramorm	<i>Ompokbimaculatus</i>	
SrakaKdam	<i>Cyclocheilichthysrepasson</i>	Migrates for breeding

Source: GMS, 2002

C. Socio-Economic Conditions

1. Population

62. According to the population census 2008, the population in Cambodia is 13.4 million of which 51.5 percent are female while 48.5 percent are male. The estimated growing rate is about 1.54 percent per annum. It shows that province of Battambang, Banteay Meanchey, Siem Reap, Kampong Thom, Kampong Cham and Prey Veng have a population of 1,025,174; 677,872; 896,443; 631,409; 1,679,992; and 947,372 persons respectively.

63. Information relative to the presence of indigenous groups in the project area is not available. With the overall positive benefits the project is expected to give, it is unlikely that indigenous groups will be affected by the project.

Table 6: Population and Administrative Statistics

Province	District/town ¹	Commune ¹	Sangkat ¹	Village ¹	Total Population ²
Battambang	14	92	10	800	1,025,174

Banteay Meanchey	9	55	10	644	677,872
Siem Reap	12	87	13	876	896,443
Kampong Thom	8	73	8	735	631,409
Kampong Cham	17	167	6	1,759	1,679,992
Prey Veng	13	113	3	1,137	947,372

Sources: ¹ Population Census (2008); ² NCDD: <http://db.ncdd.gov.kh/>

2. Poverty

64. According to the National Poverty Reduction Strategy (NPRS) of the Kingdom of Cambodia (2002), GDP per capita in 2001 was estimated at US \$ 259 of which 31.9% were affected by poverty. The Estimation of Poverty Rates at Commune-Level in Cambodia made by MOP/WFP (2002) indicated that the poverty rate in Phnom Penh is around 10-12%, other Urban Areas is 25-30% and Rural Areas is 40-50%. Based on 2002 data of NPRS, the poverty rate in Siem Reap was 54% which is about 356,800 persons, while other poverty rates in Banteay Meanchey, Battambang, Kampong Thom and Prey Veng provinces was 41% (about 228.800 persons), 26% (about 198.700 persons), 29 % (about 158.900 persons); and 53% (about 493.600 persons), respectively.

3. Employment

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

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

Table 7: Status of Employment

Status of employment	1998	2008
	Persons	Persons
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
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

67. The project area has mixed land use with some houses, small-scale business shops and wide rice fields. There are no tourist destinations located at Krong Prey Veng or nearby area. Photos of the road and the surrounding land uses are included in **Appendix 4**.

68. As observed, residents have poor access to safe water, sanitary facilities and electricity. There are no schools and markets located within the project area. Schools and health care facilities are located in Krong Prey Veng. With the completion of the project, these services will be highly accessible.

5. Cultural and Archeological Sites

69. There are no pagodas or archaeological sites located in the project area.

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Environmental Assessment Methodology

70. The Initial Environmental Examination (IEE) provides an analysis of possible impacts associated with the reconstruction of bypass road and bridges,. This was undertaken based on secondary data, review of previous reports, the EARF and short fieldworks. The main purpose is to assess the potential negative effects of the subprojects on the physical, biological and socio-economic environments and find means for the mitigation or avoidance of expected impacts.

71. It is analyzed in terms of four (4) key aspects: project location, design, construction, and operation. The impacts are classified according to the degree of impacts 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

72. The impacts are also assessed according to the duration of occurrence 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

73. This section covers a preliminary screening of potential environmental impacts of the project for each of three stages as follows:

- (i) Pre-construction: Occurring during project design and during completion of detailed design and land acquisition.
- (ii) Construction: Occurring during project construction that includes the vegetation clearing, earthworks, and road/bridge construction.
- (iii) Operation: Occurring after completion of road construction.

74. The list of potential impacts identified for the Project is presented in **Table 8**. Most of the works involve are reconstruction of detour roads and bridges, however, no major impacts are expected. Majority of the impacts occurs only during project construction. The corresponding mitigation measures provided are also presented in the same Table.

Table 8: 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"> 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. 	DDIS Consultant, IA/EA	DDIS Consultant, IA/EA
		2. Damage to existing structures	<ul style="list-style-type: none"> 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. 	DDIS Consultant, IA/EA	DDIS Consultant, IA/EA
		3) Risk of land mine or UXO	<ul style="list-style-type: none"> 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. 	DDIS Consultant, IA/EA	DDIS Consultant, IA/EA
2. Construction	Earthworks, site clearing, hauling of construction materials, piling works, Operation of construction/ workers' camps,	4). Dust generation	<ul style="list-style-type: none"> 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. Vehicles transporting materials 	Contractor	DDIS Consultant, IA/EA

Project Phase	Project Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities	
				Implement	Supervise
	borrow operation, hauling of construction wastes to spoil sites		should be covered with tarpaulin or similar material		
		5.Noise and vibration	<ul style="list-style-type: none"> The Contractor should ensure that construction activities within 100m of a village or town should be limited between 12 PM to 2 PM and at night time. Provide enclosures/barriers on major works being undertaken on sensitive areas. 	Contractor	DDIS Consultant, IA/EA
		6..Water contamination	<ul style="list-style-type: none"> Waste/used oil should be collected, properly stored and disposed to an approved site (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. The Contractor shall prepare a Spill Management Plan (including measures to be taken and equipment to be used) to ensure adequate cleanup of any 	Contractor	DDIS Consultant, IA/EA

Project Phase	Project Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities	
				Implement	Supervise
			spills		
		7. Water-borne disease	<ul style="list-style-type: none"> • Fill-up depressed areas to prevent water ponding which may be used as breeding ground for disease- carrying organisms mosquitoes • Borrow pits may be utilized for aquaculture or be developed as water reservoir for community use. 	Contractor	DDIS Consultant, IA/EA
		8..Loss of agricultural land for borrow pits	<ul style="list-style-type: none"> • The contractor will use only licensed borrow operators. There will be no side borrow permitted, unless agreed to with roadside residents. • The contractor will be responsible for rehabilitating any borrow sites opened and operated by them 	Contractor	DDIS Consultant, IA/EA
		9. Loss of trees	<ul style="list-style-type: none"> • Tree clearing should be avoided as much as possible; • The borrow pits will need to be re-vegetated before being handed back to the owner, or could be used for aquaculture. 	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"> Tree planting should be carried out in the appropriate location of the road. Coordinate with MoE regarding the species of trees to be used. 		
		10. Soil erosion	<ul style="list-style-type: none"> 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 	Contractor	DDIS Consultant, IA/EA
		11. Generation of domestic wastes	<ul style="list-style-type: none"> Sufficient garbage containers should be provided in construction camps and work sites Employ regular disposal of waste in an approved landfill or site Maintain cleanliness/orderliness at camps and work sites 	Contractor	DDIS Consultant, IA/EA
		13. Safety and Health	<ul style="list-style-type: none"> The Contractor should formulate and implement a Health and Safety Plan to protect both the public and the workers. A 	Contractor	DDIS Consultant, IA/EA

Project Phase	Project Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities	
				Implement	Supervise
			<p>trained first aid personnel and health facility should be provided on site.</p> <ul style="list-style-type: none"> • Provide potable water and sanitary facilities to workers • Install warning signs like “safety first” at the construction area including fences or enclosures • Provide Protective Personal Equipment (PPE) to workers e.g. safety shoes, hardhats, earplugs, etc. 		
		12.Traffic congestion	<ul style="list-style-type: none"> • Contractor should perform the following: i) orient their drivers or equipment operators to comply with the required speed limit. (ii) drive at low speeds, especially in market, school, hospital, urban areas. (iii) keep the roadway or bypass accessible to commuters to avoid traffic jams. (iv) park at designated area. • Prepare and implement a Traffic Management Plan • Provide appropriate storage area for the construction materials. 	Contractor/in coordination with the sub-district officials	DDIS Consultant, IA/EA

Project Phase	Project Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities	
				Implement	Supervise
			<ul style="list-style-type: none"> Detour road should be provided and accessible to commuters Temporary access of equipment and trucks must be established and approved by the sub-district officials 		
		13.Transmission of sexually transmitted disease (HIV)	<ul style="list-style-type: none"> Prepare and implement a Health and Safety Plan including education of workers on sexually transmitted disease should be done. 	Contractor	DDIS Consultant, IA/EA
		14.Generation of employment	<ul style="list-style-type: none"> The contractor should comply with the Labor and Gender Action Plan ; employ people from villages including women and unskilled workers 	Contractor	IA/EA , local authorities
3.Operation Phase	Use of bypass and the bridge	15.Traffic accident	<ul style="list-style-type: none"> Provide traffic signs on accident-prone points especially near schools, hospitals and market areas. 	IA/EA	IA/EA, local authorities

75. Such impacts are briefly discussed below:

1. Environmental impacts related to project design

a) Loss of trees

76. Although the project will only restore roads that were damaged by flood, there are still potential impacts on trees and natural forest. Trees near the project alignment and areas in primary natural forest that will be used as borrow pits for sub-base material.

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

77. Some shops, private and public assets are located along road curbside.

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.

c) Risk of Land Mine and UXO

Subprojects will reconstruct existing dyke and bridges without widening. Nevertheless, risks remain since there may be deep seated mines that could be exploded by heavy construction equipment.

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 problem related to project construction

Dust Impacts (D3)

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

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. Vehicles transporting materials should be covered with tarpaulin or similar material.

Noise Impacts (D2)

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

The Contractor should ensure that construction activities within 100m of a village or town should be limited between 12 PM to 2 PM and at night time.

Generation of domestic wastes (D2)

80. Domestic wastes will be generated from camps or living quarters. If not properly managed, it will affect public health.

81. Food containers made of plastic, styrofoam and glass bottles may pile up and serve as breeding grounds for disease-carrying organism like mosquitoes, houseflies and mouse. These may even clogged the drainage system and may cause localized flooding.

82. Contractor should ensure that (i) sufficient garbage containers are provided in construction camps and at work site, and be emptied daily, the waste being disposed of in an approved landfill or site and (ii) every camp and work site should be cleaned up before moving to new sites.

Water contamination (D2)

83. The most severe water quality impact would be from bitumen, diesel fuel or used oil. These substances are toxic to living organisms.

84. 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 at 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.

Water-borne disease (D1)

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

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

Soil erosion (D3)

87. 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.

88. 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.

Loss of trees (D1)

89. The project will only improve the existing bypass road and construction of bridge. Impact on trees is insignificant.

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

91. 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.

Loss of agricultural land for borrow pits (D1)

92. 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.

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

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

Traffic congestion (D2)

95. Traffic congestion normally occurs due to illegal parking of equipment and piling of construction materials on roadways.

96. Contractor should perform the following: i) orient their drivers or equipment operators to comply with the required speed limit. (ii) drive at low speeds, especially in market, school, hospital, urban areas. (iii) keep the roadway or bypass accessible to commuters to avoid traffic jams. (iv) park at designated area.

Traffic Accidents (D2)

97. Traffic accidents can happen when motorists drive at night without lights. Also accidents can be caused by illegal parking, deep excavations, soil piled along roads with no warning signs. Accidents are also caused by careless, high speed or unprofessional driving.

98. Contractor should: (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.

Safety and Health (D2)

99. Accidents inevitably happen during construction, hence, the Contractor should formulate and implement a Health and Safety Plan to protect both the public and the workers. A trained first aid personnel and health facility should be provided on site. Potable water and sanitary facilities should be provided to workers.

Transmission of sexually transmitted diseases (D2)

100. HIV/AIDS is still prevalent in Cambodia thus it may happen due to influx of workers from various provinces.

101. The contractor should incorporate in the health and safety plan the education of workers on sexually transmitted disease.

3. Environmental problem related to project operation

Traffic accident (D2)

102. As a result of the improved 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.

103. Some measures to improve road safety are:

- (i) Provide traffic signs at corner or curved roads, especially near schools, hospitals and market areas.
- (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

During project construction:

104. **Livelihood/income** Increased opportunities for local people to be employed in 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 to them before starting works.

During project operation:

105. **Easier Transport at Reduced Costs (+D3):** The use of the bypass road and new bridge will reduce travel time and transport costs. It will improve access to services, especially access to medical facilities.

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

107. **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 9: Environmental Monitoring Plan (EMoP)

Issue	Mitigation Measures (Items to Monitor)	Monitoring Required/Methods/Parameters	Schedule / Frequency	Start/ Completion Date	Reporting	Responsibility
Pre-Construction Phase						
Loss of trees	<ul style="list-style-type: none"> 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. 	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"> 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. 	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"> 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. 	Verify Information from local communities	Before the mobilization of contractor	Before the mobilization of contractor	Information from local communities	DDIS Consultant, EA, IA
Construction Phase						
Dust	<ul style="list-style-type: none"> After appointment and 	Check copy of	Monthly	Start of	Proof that	DDIS

Issue	Mitigation Measures (Items to Monitor)	Monitoring Required/Methods/ Parameters	Schedule / Frequency	Start/ Completion Date	Reporting	Responsibility
generation	<p>mobilization the contractor, own version of the EMP known as the Contractors EMP (CEMP) should be prepared. 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.</p> <ul style="list-style-type: none"> • 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. • Vehicles transporting materials should be covered with tarpaulin or similar material 	<p>IEE/EMP of the contractor ;;</p> <p>Check CEMP</p> <p>Check copy of the Dust Abatement Plan</p> <p>Check level of dust pollution by:</p> <ul style="list-style-type: none"> -Aesthetics thru visual observation -Feedback from village people 		Construction stage/Constructi on stage	<p>copies of the IEE/EMP are received by the contractor;</p> <p>Compliance monitoring reports</p>	Consultant, EA,IA, Contractor's Safeguard Specialist (self monitoring)
Noise and vibration	<ul style="list-style-type: none"> • The Contractor should ensure that construction activities within 100m of a village or town should be limited between 12 PM to 2 PM and at night time. 	<p>Feedback from village people about noise concern</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
Generation of domestic wastes	<ul style="list-style-type: none"> Sufficient garbage containers should be provided in construction camps and work sites Employ regular disposal of waste in an approved landfill or site Maintain cleanliness/orderliness at camps and work sites 	Check aesthetics thru visual observation	Monthly	Construction stage	Compliance monitoring reports	DDIS Consultant, EA, IA, Contractor's Safeguard Specialist (self monitoring)
Water contamination	<ul style="list-style-type: none"> Waste/used oil should be collected, properly stored and disposed to an approved site (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. 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 	<p>Check copy of Spill Management Plan; records of waste/used oil 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 thru visual inspection</p>	Monthly	Construction stage	Compliance monitoring reports	DDIS Consultant, EA, IA, Contractor's Safeguard Specialist (self monitoring)
Water-borne	<ul style="list-style-type: none"> Contractor must ensure that 	Visual observation – stagnant water/water	Monthly	Construction	Compliance monitoring	DDIS Consultant, EA,

Issue	Mitigation Measures (Items to Monitor)	Monitoring Required/Methods/Parameters	Schedule / Frequency	Start/ Completion Date	Reporting	Responsibility
disease	(i) solid wastes are regularly disposed into safe landfill <ul style="list-style-type: none"> • Locate camps distant to communities • Fill-up depressed areas to prevent water ponding which may be used as breeding ground for disease- carrying organisms mosquitoes • Borrow pits may be utilized for aquaculture or be developed as water reservoir for community use. 	ponding due to construction		stage	reports	IA, Contractor's Safeguard Specialist (self monitoring)
Loss of agricultural land for borrow pits	<ul style="list-style-type: none"> • The contractor will use only licensed borrow operators. There will be no side borrow permitted, unless agreed to with roadside residents. • The contractor will be responsible for rehabilitating any borrow sites opened and operated by them 	Check records on borrow sites ;license of borrow pit operators; rehabilitation done ; status of borrow sites used				
Loss of trees	<ul style="list-style-type: none"> • Tree clearing should be avoided as much as possible; • The borrow pits will need to be re-vegetated before being handed back to the owner, or 	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
	<p>may be used for aquaculture.</p> <ul style="list-style-type: none"> Tree planting should be carried out in the appropriate location of the road. Coordinate with MoE regarding the species of trees to be used. 					
Soil erosion	<ul style="list-style-type: none"> 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 	<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)
Safety and Health	<ul style="list-style-type: none"> The Contractor should formulate and implement a Health and Safety Plan to prevent accident both on the side of the public and the workers as well. A trained first aid personnel and health facility should be provided on site. Provide potable water and sanitary facilities to workers Install warning signs like 	<p>Check copy of Health and Safety Plan; health/accident records</p> <p>Visual observation – Safety signs installed, workers in PPE and without PPE</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
	<p>“safety first” at the construction area including fences or enclosures</p> <ul style="list-style-type: none"> Provide Protective Personal Equipment (PPE) to workers e.g. safety shoes, hardhats, earplugs, etc. 					
Traffic congestion	<ul style="list-style-type: none"> Contractor should perform the following: i) orient their drivers or equipment operators to comply with the required speed limit. (ii) drive at low speeds, especially in market, school, hospital, urban areas. (iii) keep the roadway or bypass accessible to commuters to avoid traffic jams. (iv) park at designated area. Prepare and implement a Traffic Management Plan Provide appropriate storage area for the construction materials. Detour road should be provided and accessible to commuters Temporary access of equipment and trucks must be 	<p>Feedback from village people about traffic; visual observation</p> <p>Check copy of Traffic Management Plan</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
	established and approved by the sub-district officials					
Generation of employment particularly among women and unskilled people	<ul style="list-style-type: none"> 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)
Operation Phase						
Traffic accident	<ul style="list-style-type: none"> 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,

VI. ANALYSIS OF ALTERNATIVES

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

- With the project (Reconstruction of bridges and upgrade detour road on existing alignment,)
- Without the project

109. Table 10 summarizes the rapid assessment done on the two (2) options in terms of environmental, social and economic considerations.

Table 10: Rapid assessment of detour road and bridges reconstruction options

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

110. Based on assessment, the option to reconstruct the existing bridges and upgrade of detour road is the preferred option. This would resolve existing environmental and social issues associated with the present condition of such structures.

111. Two further sub-options in replacing the existing bridges were considered. The first option is involved with replacing 1 lane bridge by 1 lane bridge and the second option is replacing 1 lane bridge by 2 lane Bridge. Nevertheless, the existing road is 2 lanes, so it is better to have 2 lane - bridge to reconstruct the existing one to improve safety and traffic flow.

VII. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

112. 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 Safeguards Specialist within 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 formed in each of the IAs – MPWT, MRD, and MOWRAM. Each PIU has a Safeguards Focal Persons, 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 APs – Affected Persons.

113. 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 if necessary.

114. A series of consultation meetings with local authorities and communities have been conducted during the project development and design related to resettlement, design, environment and social factors. Furthermore the preparation of local community consultation should be continued for every stage of project design and implementation thus realistic impacts and issues will be updated and all impacts will be mitigated timely. All such meetings encourage the full participation of the local communities.

VIII. GRIEVANCE REDRESS MECHANISM

115. During site preparation and construction phases, there may be 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 start of site works:

- i) Establish a grievance redress mechanism (GRM)
- ii) Make public the existence of the GRM through public awareness campaigns

- iii) 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)

116. Through a Grievance Redress Committee (GRC), promptly address affected people's concerns, complaints, and grievances about the project's environmental performance at no costs 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 organization. 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.

117. 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.

118. The GRC will receive, follow-up and prepare monthly reports regarding 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.

119. 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.

120. 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. 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.
- Three 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.
- Confirmation with complainants that they are satisfied

121. 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.

122. The procedure is shown in Figure 6 below.

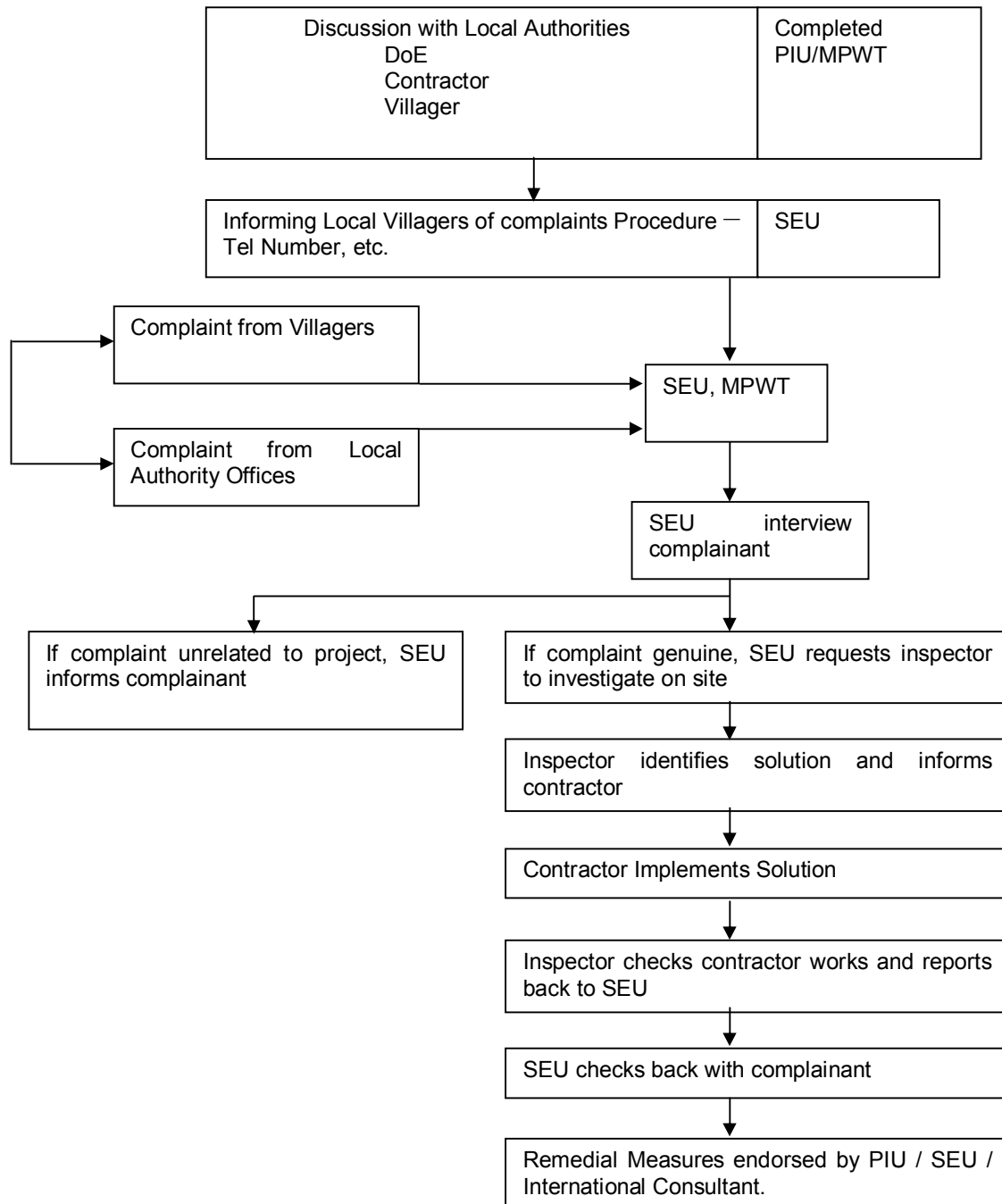


Figure 6: Investigations Procedure

IX. ENVIRONMENTAL MANAGEMENT PLAN

123. 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.

124. 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.

125. 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.

126. 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.

127. 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.

128. 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.

129. 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:

- i. conduct periodic site visits for projects with adverse environmental impacts;
- ii. 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;

- iii. 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
- iv. 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.

X. CONCLUSION AND RECOMMENDATION

130. 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 result to many benefits to communities in the project area in terms of livelihood, health, reduced risk to life and properties. Travel will be safer, less cost and less travel time.

131. During construction, a number of temporary negative impacts including dust, noise, road safety, worker's safety, wastewater, solid waste and water contamination will occur, however, those impacts are avoidable and can be reduced by environmental control measures and mitigation measures.

132. In order to reduce the impacts, the alternative approaches are recommended as follows:

- The environmental mitigation measures and environmental monitoring plan which are presented in the IEE report should be implemented. (A suggested draft EMP is given in Appendix 2)
- Good cooperation between all stakeholders, especially IA, EA and local authorities should be undertaken.
- Consultation with the local community should be implemented 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 farmers whose land they will be excavated on.

133. 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 detail EIA study is required.

XI. APPENDIX

A. 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
A	Industrial	
I	Foods, Drinks, Tobacco	
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
II.	Leather tanning, Garment and Textile	
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

No.	Type and activities of the projects	Size / Capacity
III.	Wooden production	
1.	Plywood	$\geq 100,000 \text{ m}^3/\text{year}(\log)$
2.	Artificial wood	$\geq 1,000 \text{ m}^3/\text{year} (\log)$
3.	Saw mill	$\geq 50,000 \text{ m}^3/\text{year} (\log)$
IV.	Paper	
1.	Paper factory	All sizes
2.	Pulp and paper processing	All sizes
V.	Plastic, Rubber and Chemical	
1.	Plastic factory	All sizes
2.	Tire factory	$\geq 500 \text{ Tones /year}$
3.	Rubber factory	$\geq 1,000 \text{ Tones /year}$
4.	Battery industry	All sizes
5.	Chemical production industries	All sizes
6.	Chemical fertilizer plants	$\geq 10,000 \text{ Tones /year}$
7.	Pesticide industry	All sizes
8.	Painting manufacturing	All sizes
9.	Fuel chemical	All sizes
10.	Liquid, powder, solid soaps manufacturing	All sizes
VI	<i>Mining production other than metal</i>	
1.	Cement industry	All sizes
2.	Oil refinery	All sizes

No.	Type and activities of the projects	Size / Capacity
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
13.	Cow oil and motor oil manufacturing	All sizes
14.	Petroleum study research	All sizes
VII	<i>Metal industries</i>	
1.	Mechanical industries	All sizes
2.	Mechanical storage factory	All sizes
3.	Mechanical and shipyard enterprise	All sizes
VIII	<i>Metal Processing Industrials</i>	
1.	Manufacturing of harms, barbed wires, nets	≥ 300 Tones/month
2.	Steel mill, Irons, Aluminum	All sizes
3.	All kind of smelting	All sizes
IX	<i>Other Industries</i>	

No.	Type and activities of the projects	Size / Capacity
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. AGRICULTURE		
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
C. TOURISM		
1.	Tourism areas	≥ 50 Hectares
2.	Goal field	≥ 18 Holes
D. INFRASTRUCTURE		
1.	Urbanization development	All sizes
2.	Industrial zones	All sizes

No.	Type and activities of the projects	Size / Capacity
3.	Construction of bridge-roads	≥ 30 Tones weight
4.	Buildings	Height ≥ 12 m or floor $\geq 8,000$ m ²
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	$\geq 50,000$ m ³
13.	Damping site	$\geq 200,000$ people

B. 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:

- (a) 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);
- (b) Changes in project scope and adjusted safeguard measures, if applicable;
- (c) Qualitative and quantitative monitoring data;
- (d) Monitoring parameters/indicators and methods based on the monitoring plan/program previously agreed upon with ADB;
- (e) 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.);
- (f) 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.);
- (g) If noncompliance or any major gaps identified, include a corrective action plan;
- (h) Records on disclosure of monitoring information to affected communities;
- (i) Identification of key issues, or complaints from affected people, or recommendations for improvement;
- (j) Monitoring adjustment measures recommended based on monitoring experience/trends and stakeholders response;
- (k) Information about actual institutional arrangement for implementing the monitoring program/plan provided or adjusted, as may be required;
- (l) Proposed items of focus for the next report and due date.

C. Appendix 3: Project area illustration



Krong Prey Veng Bridge traversed a heavily silted stream as sediments is carried by flash floods



The bridge is quite narrow which allow only one vehicle (car/truck) to pass at a time



City wastes are dumped at the road corridor, which causes unpleasant aesthetics and odor



During dry season, dust pollution is significant as vehicles passes by the laterite surface detour road



Few small business shops and small houses are located along the alignment, however, there will be no resettlement issues involved.



Borrow pit is not far from the location of subprojects. Clearance from concerned parties is necessary for areas to be used as borrow pit.

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