

Initial Environmental Examination

September 2014

Cambodia: Flood Damage Emergency Reconstruction Project- Additional Financing

Prepared by Ministry of Rural Development for the Asian Development Bank.

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APPENDIX 1

FLOOD DAMAGE EMERGENCY RECONSTRUCTION PROJECT- ADDITIONAL FINANCING

**ADB Loan No.3125-CAM (SF) and Government of Australia
(Department of Foreign Affairs and Trade) Grant No.0285-CAM (EF)**

INITIAL ENVIRONMENTAL EXAMINATION

for

FDERP-AF-MRD-STAGE 2

ABBREVIATIONS

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
FDERP-AF	Flood Damage Emergency Reconstruction Project-Additional Financing
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
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 (in MRD)
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
US\$	United States Dollar
UXO	Unexploded Ordnance
WB	World Bank

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I. Executive Summary

1 The Asia Development Bank (ADB) and the Royal Government of Cambodia (RGC) has agreed to implement the Flood Damage Emergency Reconstruction Project-Additional Financing (FDERP-AF), which will be financed by a project loan from the ADB and grant from the Government of Australia. The FDERP is being implemented through the Ministry of Economy and Finance (MEF) as the executing agency (EA). There are three implementing agencies (IAs): (i) Ministry of Public Works and Transport (MPWT) for output 1; (ii) Ministry of Rural Development (MRD) for output 2, and (iii) Ministry of Water Resource and Meteorology (MOWRAM) for output 3.

2 The purpose of this Initial Environmental Examination report (IEE) is to provide an assessment of the environmental concerns that need to be taken into account with regard to the rehabilitation of part of flood damaged national and provincial roads in five provinces. The project has been classified as Category “B” for environmental impact, and the IEE has been carried out in accordance with the procedures described in “Environmental Guidelines for Selected Infrastructure Projects” Office of the Environment, (ADB 1993). The IEE is prepared in ADB’s IEE format as outlined in the “Environmental Assessment Requirements of the Asian Development Bank” (ADB 1998).

3 The IEE provides an initial rapid screening of the activities to be carried out under the proposed project, with the intention of identifying potentially significant environmental impacts, determining appropriate mitigation measures, and identifying if any further environmental assessment is required. With limited time of the preparation of the IEE, it is assessing only through existing secondary data from the project and other similar projects.

4 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 in overall benefits to communities in terms of livelihoods and connection between community and community, especially for students, pregnant women and ill people who will be able to easily gain access to school and hospitals in time.

5 During construction a series of temporary negative impacts including dust, noise, road safety, worker’s safety, wastewater, solid waste and water contamination will occur. Those impacts are manageable and can be reduced with appropriate environmental control and mitigation measures. Once operational, benefits will include improved community livelihood, public health, tourist access and general amenity.

6 In order to reduce the impacts, the following alternative approaches are recommended:

- Environmental mitigation measures and the environmental monitoring plan as presented in the IEE report should be implemented.
- Good cooperation between All stakeholders, especially the IA, EA and local authorities, should adopt an approach of constructive cooperation.
- 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 farmers whose land they will be excavated on.

7 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 recommendations will avoid/reduce the impacts to minimal levels. Hence no detail EIA study is required.

II. Policy, Legal, and Administrative Framework

A. Policy Framework

8 In 1993 the Royal Government of Cambodia confirmed a new Constitution in which environmental considerations were included for the first time. Specifically Article 59 states: *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 resources* and it was within this constitutional context that the Ministry of Environment (MOE) was established.

9 The hierarchy of legislation in Cambodia is :

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

10 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

11 1996 the Law on Environmental Protection and Natural Resource Management (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.

12 Other ministries explicitly mentioned at the time were Ministry of Water Resources 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

13 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 3 Zones to Protect Temple Surrounding Areas in All Provinces and Municipalities Except Angkor Wat", 1996. These laws protect small temples or ancient structures.

3. Laws on Nature Reserves

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

4. Laws on Wildlife

15 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

16 The “Law on Environmental Protection and Natural Resource Management” (1996) is “enabling legislation”, in that it 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.

17 Several sub-decrees are already laws. Others have been drafted and are expected to become law in the near future. These standards give parameters and values which must be measured to check compliance with the regulations. Even if the regulations are in draft form, the contractors are expected to comply with them.

b. Sub-Decree on Air and Noise Pollution Control

i. Air Quality (Draft)

18 The air pollution regulations are contained in Draft Sub-Decree on Air and Noise Pollution. For dust control, there should be 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.

ii. Noise (Draft)

19 The noise regulations are contained in Draft 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)

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 one gaining access to a private residence. The level of 75dB(A) daytime / 65 dB(A) nighttime is a “good” standard and commonly used in countries such as Singapore and Malaysia.

iii. 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). The level of 1mm/second ppv is a good “standard” and is 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) (Draft)

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

There is no legal standard for performance of septic tanks but they should be checked for correct operation: that is absence of smell; no overflowing; and no surface water logging.

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

22 Under the Draft 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 would include :

- All general waste and food waste should be removed to a government approved landfill.
- All demolition waste must be removed to a government approved location.
- All waste oils and greases should be removed by a registered subcontractor. The final destination should be established.

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

e. Hazardous Substances

23 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 of in a manner approved by the MoE.

C. Administrative Framework

1. Protected Areas

24 Cambodia has a network of 23 natural protected areas managed through the Ministry of Environment (MoE). These areas cover 2.2 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.

25 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

Details are:

- **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.

26 The Law on Forestry Management prohibits the hunting of wildlife within such protected areas. As well as maintaining checkpoints and providing rangers, the Ministry of Environment (MoE) has an active community education program to promote environmental awareness especially within the rural communities.

27 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

28 On 11 August 1999 a Sub-decree (72 ANRK.BK) on EIA Processes 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 table below)

29 The Sub-decree No 72 ANRK.BK. Date 11, August 1999 Annex "List of the projects that require an Initial Environmental Impact Assessment" refers to "National Road Construction \geq 100 Kilometers and bridges \geq 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

30 The Project will restore critical public and social infrastructure assets necessary to restore livelihood, access in project provinces that will secure the social infrastructure services against future flooding. The Project will have four project outputs:

(i) Output 1: National and provincial roads rehabilitation.

For Stage 1, this project component aims to reconstruct flood damaged provincial roads in 3 provinces. In Kampong Cham, 1 bridge along provincial road (PR) 270 which was severely weakened by the floods will be replaced. In Banteay Meanchey, 11.2 km of PR 156D will be repaired and upgraded, and one 30 m bridge will be replaced. In Kampong Thom, 8.15 km of PR 264E and 7.50 km of PR 264D will be reconstructed. For Stage 2, the project will include reconstruction of flood damaged national and provincial roads in 4 provinces. This will include: (i) in Kampong Cham, reconstruction of 16.19 km of national road (NR) 70; (ii) in Battambang, reconstruction of 19.70 km of PR 1570, (iii) in Siem Reap, reconstruction of 6 km of NR 63 and 11.3 km of PR 265F, and (iv) in Banteay Meanchey, the combination works of 4.5 km of PR 156D before a new 75 m bridge, 9.3 km after the bridge of PR 156 D, and 24.8 km of PR 2563. Details of these works are outlined in the MPWT subprojects list in Indicative list of Subprojects is shown in Appendix 2 of Project Administration Manual. The existing IA consultants will be retained to support the RGC in preparing designs for the works and supervising implementation.

(ii) Output 2: Rural roads rehabilitation.

Rural roads have incurred extensive damage during the flash floods of 2013. This disrupted land based communication, with normal daily support access and lifelines cut off and/or disrupted for several weeks. Candidate subprojects for reconstruction have been selected in accordance with the Subprojects Selection Criteria (Appendix 1). The total estimate of highest priority roads for Stage 2 are: 114.7 km, at a cost of \$4.53 million, to benefit 125,414 people, with rehabilitation of damaged surface and structures; and for Stage 3 – 141.9 km roads, at a cost of \$18.30 million, to benefit 158,993 people, with improvements to ensure more reliable and efficient access between rural communities and markets. The nominated subprojects under each Stage include roads in 5 priority provinces: Kampong Cham, Kampong Thom, Siem Reap, Banteay Meanchey, and Battambang. Some of the Stage 3 works includes upgrading a subset of the Stage 2 roads, and these have been selected based on priority requirements for improvement and long term climate resilience¹. The list of proposed subprojects for Output 2 is presented in Appendix 2 of Project Administration Manual. The scope of work to be undertaken for MRD subprojects has been supplemented by the provision of additional co-financing from Australian Government, such that longer sections of each road in overall subprojects can be paved with reinforcing cement concrete.

(iii) Output 3: Irrigation rehabilitation and flood management.

This output will involve two parts.

Part 1: infrastructure rehabilitation and improvement: out of a long list (Appendix 2 of Project Administration Manual) of 17 flood damaged irrigation infrastructure subprojects, up to 9 irrigation schemes covering about 37,500 ha in at least 5

¹ The approach to promoting labor intensity (where feasible) will follow the principles of the public works component of Cambodia's 2011 National Social Protection Strategy for the Poor and Vulnerable. The approach to improving maintenance of the rural roads will draw from the ongoing related activities of the Loan 2670-CAM: Rural Roads Improvement Project and Loan 2839-CAM: Provincial Roads Improvement Project.

provinces, Battambang, Banteay Meanchey, Oddar Meanchey, Siem Reap and Kampong Thom, can be reconstructed and improved within the available budget, based on MOWRAM initial estimates. Stage 2 works (\$5.8 million) will involve urgent rehabilitation works to restore service functionality with implementation to be completed through the 2014 dry season. Stage 3 works (\$10.7 m), where infrastructure improvements are proposed over and above basic reconstruction, will be implemented during the 2015/16 dry seasons, with the overall outcome of increasing future flood resilience and mitigating flood damage risk.

Part 2: to enhance the effectiveness of the proposed reconstruction and improvement works, it is proposed that a pilot activity be implemented to improve the existing Hydromet system in flash flood affected catchments in Battambang and Banteay Meanchey. (with an estimated cost of \$1.0 million). This will focus on three river catchments to form the basis for improved flash flood forecasting capacity, with the initial priority given to the Sisophon catchment. The Hydromet when complete should be able to provide real time data as support for implementing strategic flood management plans at key MOWRAM storage infrastructure, to mitigate recurrent flood risks if large flows are not adequately managed through those water storages. The provision of real time data will assist MOWRAM to make early flood estimates and provide early warning to other line agencies and the community, thereby helping to mitigate flood impacts other public infrastructure. MOWRAM's consultants will assist by supervising the Hydromet design and installation, and in preparing the strategic water management plans for impacted infrastructure, together with assistance to design, procure the infrastructure works and supervision of implementation.

The pilot Hydromet will involve the installation and/or upgrade of 8 all weather synoptic meteorological stations (AWS) and up to 10 hydrological stations at key locations across the three designated catchments in Battambang and Banteay Meanchey. The initial pilot work (2014) will commence on Stung Sisophon in Banteay Meanchey. MOWRAM indicate they have already undertaken some Hydromet upgrades in 5 provinces, and it is proposed the new system will be compatible (data format, communications protocols, data handling and processing) with those systems, and will also be linked and compatible with plans now being developed for funding by other agencies (e.g. UNDP, KOICA, JICA, and WB), intended to cover other parts of Cambodia. The objective of the Hydromet pilot will be to get earliest meteorological and stream flow data and warning of developing transboundary runoff from Thailand entering the Cambodian catchments, and together with rainfall forecasts and measurement, will enable early estimates of impending flood flows, providing the basis for issuance of warnings to all concerned at the earliest opportunity. The pilot Hydromet upgrade in the Sisophon catchment will be implemented in 2014/15, and lessons learnt from this will be used to extend the system into the Mongkol Borey and Sangker catchments through 2015 and 2016.

Besides data collection and telemetry, calibrated models will be needed to process the data and generate warnings to the likely affected communities and infrastructure line agencies, to guide their early flood mitigation actions. Improved data acquisition and modelling will enable all line agencies to periodically check and update the adequacy of their infrastructure and flood preparatory and response plans in future years. The outcome will be enhanced institutional capacity to manage flood forecast systems, prepare and implement flood response plans, and thereby mitigate risk to communities and their essential district, regional and national infrastructure (i.e. public assets). Together with strengthening the damage affected infrastructure, this could also identify and define activities to be part of a possible follow on flood mitigation and management project for the flood affected regions, and simultaneously provide a model for planning and operating similar works around the country.

(iv) **Output 4: Project Management and Facilitation:** This output will support the EA to undertake overall oversight and management of the Project. It will be supported by consultants to ensure that procedures are followed and that implementation schedules are kept on track. The PCMU Consultant resources will be extended to assist the EA and IAs with the coordination and development of the project components, and will also oversee MOWRAMs development of its Hydromet, and the provision of outputs from the system to concerned stakeholders to improve the cross-sector flood management strategy for the affected areas. Effective national oversight and coordination of the Hydromet development will be required to ensure all parties remain engaged and fully informed, and can prepare and be ready (resources, finances) to implement flood action plans. This will be a responsibility of MEF's Project Coordination and Management Unit (PCMU) during project implementation.

31 This IEE includes the preparation of environmental assessments and environmental management plans (EMPs) developed for roads (outputs 1 and 2).

IV. Description of the Environment

1. Physical environment

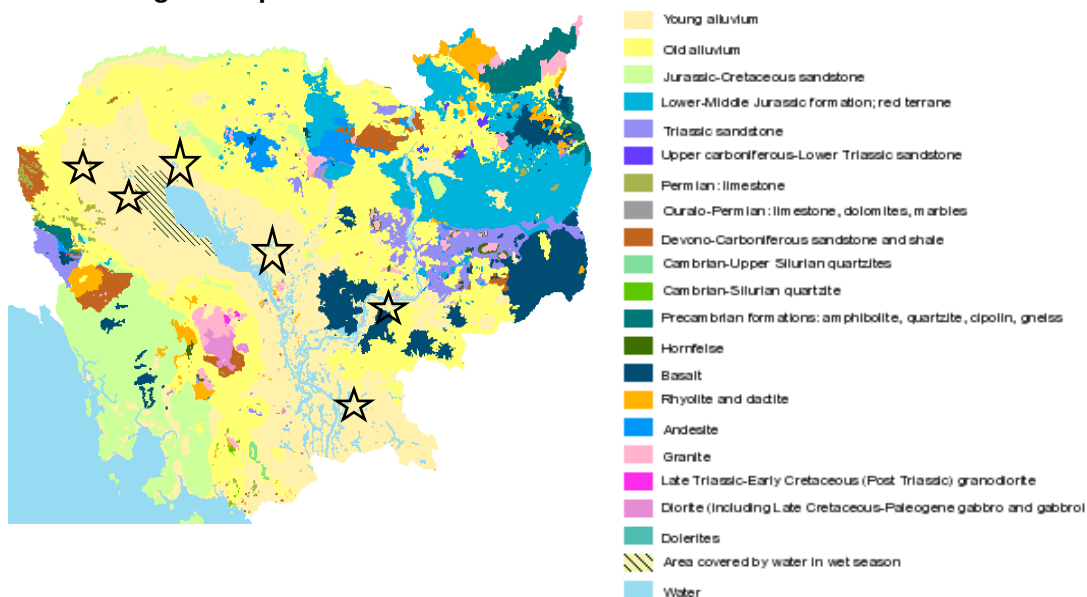
Topography, geology and soil

32 Cambodia is bordered 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 provinces and capital city. The selected provinces of the project are Battambang, Banteay Meanchey, Siem Reap, Kampong Thom and Kampong Cham provinces where located in floodplain of the lower Mekong River Basin in Cambodia.

33 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 through to the 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 above the plain. 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.

34 The geology of the Battambang and Banteay Meanchey areas is characterized by young alluvium soils (see geological map in **Figure 1** below) made up by 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 1: Geological Map



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

Climate

35 The climate of the area is characterized by distinct rainy and dry season. The project areas are effluence from the monsoon wind. The southwest monsoon starts in May and lasts till October called as the dry season, while from November to April the dry northeast monsoon occurs.

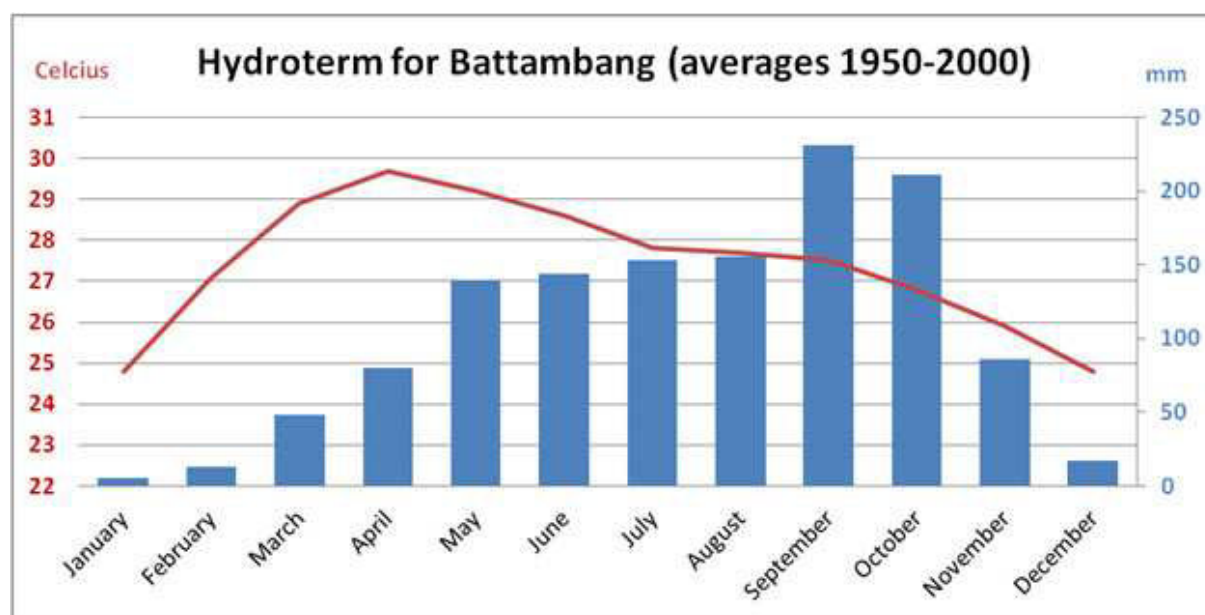
36 The average rainfall in Battambang is 1300 mm, with peak rainfall occurring in September/October and the lowest rainfall in February. As for the temperature, it is lowest in December/January with average minimum temperature of 26°C and the highest in April with average minimum of 34°C. The wind direction during the rainy season is prevalent from south-west to north-east while opposite during the dry season. **Figure 2** below illustrates the average rainfall in Battambang, as well as maximum through the past 30 years. According to the Kampong Cham, Kampong Thom, Siem Reap and Banteay Meanchey, they are located in floodplain areas like Battambang thus the wind effluence, temperature and rainfall are quite similar.

Water resource

37 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 Stueng 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 by acting as storage; both moderates flood flows during the wet season and maintains low flows during the dry season.

38 As for 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.

Figure 2: Average rainfall in BTB (1950-2000)



Source: CTD, 2012

Ground water

39 Groundwater is an important source of domestic water in the study area for both residential development and commercial development. However, it has been a problem

during the dry season, both water quality and quantity, in some of the areas. However, there is no detailed data on groundwater availability in the study area is available.

2. Ecological environment

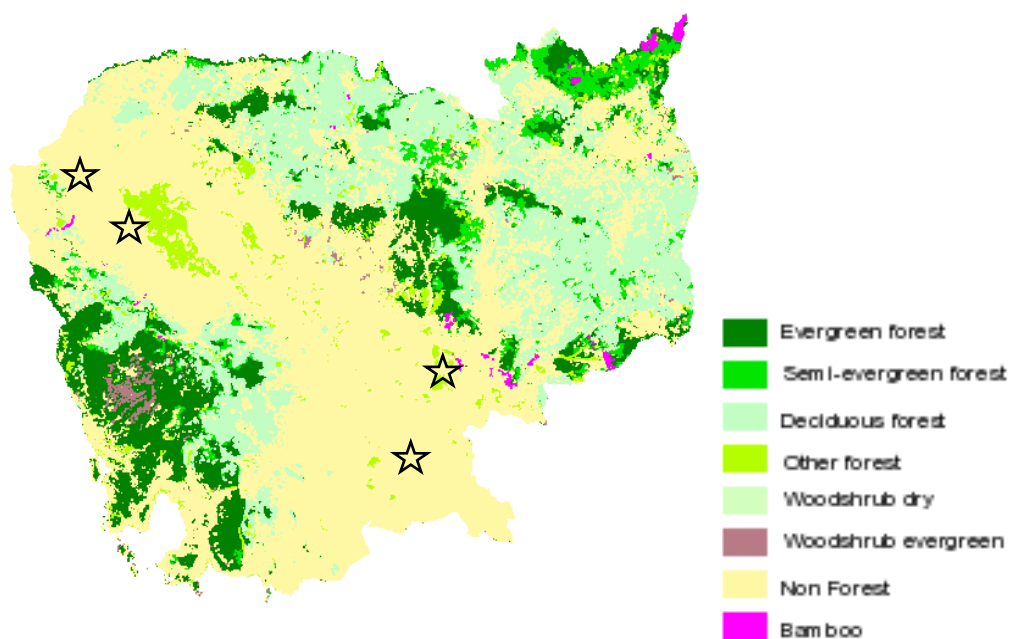
Forest and vegetation

40 The natural forest in project areas has almost completed. The land areas are dominated by agricultural land (see **Figure 3** below). Agricultural activities including rice field and vegetation are increasing in the project areas. The proposed sites of road improvement are not close to any sensitive protected areas or protected biodiversity under control by government. Only some economic trees such as coconut, mango, papaya, banana, jackfruit and others are found at some sections of the project roads will be minimally affected.

Rare or Endangered Species

41 Given the largely urban, economic developmental nature and result on land encroachment of the project area, no rare or endangered species are expected to be present now.

Figure 3: Land cover context



Source: CTD, 2012

Protected areas

42 Protected Areas in Cambodia are under control by Ministry of Environment (MOE). Twenty-three of protected and wildlife conservative areas were created in 1993, of which are located in the project province, Kampong Thom, Siem Reap, Banteay Meanchey and Battambang (**Table 1**). This law doesn't create any protected areas in Kampong Cham yet in 1993 (Table 1). According to the GMS (2002), the protected areas in Banteay Meanchey and Battambang are established additionally (**Table 2**).

43 Law of the projected areas also described that every protected area shall be protected and controlled from any negative impacts of every activity mentioned in article 41. Every development or project in the protected areas will be banned except those are approved by Minister of Ministry of Environment in terms of benefits to natural resource conservation and management purposes. 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 1: Description of the protected areas administrated by the MOE

Protected area	Surface area (ha)	Province
Natural Parks: 871,250 ha		
Bokor	140,000	Kampot
Botum Sakor	171,250	Koh Kong
Kep	5,000	Kep
Kirirum	35,000	Kampong Speu and Koh Kong
Phnom Kulen	37,500	Siem Reap
Ream	150,000	Sihanouk-Ville
Virachey	332,500	Stueng Treng and Rattanakiri.
Wildlife Preserves: 2,030,000 ha		
Boeng Per	242,500	Kampong Thom
Kulen Promtep	402,500	Siem Reap, Oddor Meanchey and Preah Vihear
Lumphat	250,000	Rattanakiri and Mondulkiri.
Peam Krasoab	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
Roneam Donsam	178,750	Battambang
Snoul	75,000	Kratie
Protected scenic view areas: 500,950 ha		
Angkor	10,800	Siem Reap
Banteay Chmar	81,200	Banteay Meanchey
Dung Peng	27,700	Koh Kong
Preah Vihear	5,000	Preah Vihear
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 2: Protected Areas in the Province of Banteay Meanchey and Battambang

Protected Area	Province	Total Size (ha)	Characteristics
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Ang Trapang Thmor Sarus Crane Conservation Area	Banteay Meanchey	12,650	Important site for the Eastern Sarus Crane and other water fowl that have established a habitat on the reservoir.
Ronem Daun Sam Wildlife Sanctuary	Banteay Meanchey 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).
Banteay Chhmar Protected Landscape	Banteay Meanchey	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 Ang Trapeang Thmor Sarus Crane Conservation Area, WCS, 2001.)

Wildlife

44 As indicated in Table 2, wildlife is very rare in the project areas. Most of the areas are converted to be agricultural and residential use. No rare or endangered fauna are resident within or adjacent to the proximity of the project roads. None of the roads passes through any forested or protected areas.

Fish

45 Fish are an important source of vitamin in the diet of the people living in Cambodia. The roads are located in a flood plain that is linked to the Tonle Sap Lake and the Lower Mekong River which are very essential for fish production. The production of the lake is estimated at about 65kg per ha 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 found in the Lake and flood plain areas are presented in Table 3.

Table 3: Fish commonly found in the Tonle Sap and Floodplain area

Local Name	Scientific Name	Comments
Trei Ros/ Ptuok	<i>Channa striata</i>	Migrates for breeding
Trei Andeng Tun	<i>Clarias macrocephalus</i>	Migrates for breeding
Trei Chhpin	<i>Barbodes gonionotus</i>	
Trei Riel	<i>Henicorhynchus siamensis</i>	
Chhlang	<i>Mystus filamentus</i>	
Trei Kes	<i>Micronema bleekeri</i>	
Trei Kagnchruk	<i>Botia modesta</i>	
Trei Kamphleanh	<i>Trichogaster trichopterus</i>	Migrates for breeding
Trei Kamphleav	<i>Kryptopterus moorei</i>	Migrates for breeding
Kanh Chanh Chras	<i>Pseudambassis notatus</i>	
Kanh Chos	<i>Mystus mysticetus</i>	Migrates for breeding
Kan Trob	<i>Pristolepis fasciata</i>	
Khong Veng	<i>Dangila lineata</i>	Migrates for breeding
Kranh	<i>Anabas testudineus</i>	Migrates for breeding
Kros phnom	<i>Poropuntius deauratus</i>	Migrates for breeding
Angkat Prak	<i>Cyclocheilichthys microlepis</i>	
Slat	<i>Notopterus notopterus</i>	

Ta Aun/ Kramorm	<i>Ompok bimaculatus</i>	
Sraka Kdam	<i>Cyclocheilichthys repasson</i>	Migrates for breeding

Source: GMS, 2002

3. Human and economic development

Population

46 According to the population census 2008, Cambodia has 13.4 million people (51.5 percent female, 48.5 percent male). The estimated growth rate is about 1.54 percent per annum. It shows that province of Battambang, Banteay Meanchey, Siem Reap, Kampong Thom and Kampong Cham have a population of 1,025,174; 677,872; 896,443; 631,409; and 1,679,992 persons.

Table 4: 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

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

Poverty

47 According to the GMS (2002), GDP per capita in 1999 was estimated at \$290 with 36 percent of the people affected by poverty. Rural poverty is higher at 40 percent versus 30 percent in urban areas. According to ADB (2007), the poverty rate in Siem Reap was 54 percent which estimated number of poor people was about 356,800 persons.

Employment

48 Economic and social development of a country depends on the numbers of persons who are economically active.

49 The 2008 census shows a total population of 13,395,682 persons, of which 6,935,246 persons employed, and 118,152 persons unemployed, having decreased from 273,183 persons in 1998 (Table 5).

Table 5: 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

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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)

V. Screening of Potential Environmental Impacts and Mitigation Measures

1. *Environmental Assessment Methodology*

50 This Initial Environmental Examination (IEE) provides an analysis of possible impacts associated with restoration of highways and rural road renovation, and is prepared based only on secondary data, a review of previous reports, and the EARF. The main purpose is to assess potential impacts on physical, biological and socio-economic environments and find possible measurement for mitigation or avoidance.

51 Impacts are analyzed in terms of 4 key aspects: project location; design; construction; and operation. The impacts are classified according to the degree and 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

52 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.

2. *Screening of environmental impacts*

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

- (i) Pre-construction: Occurs during project design and during completion of detailed design and land acquisition;
- (ii) Construction: Occurs during project construction, including vegetation clearing, earthworks, and road construction; and
- (iii) Operation: Occurs after completion of road construction.

54 The list of potential impacts identified for the Road Improvement Project is discussed in **Table 6**. Most of the works involve restoration of existing roads, so the impacts for the most part will be incremental in nature, and major impacts are not expected. No impacts are expected on sensitive areas such as protected areas, wildlife, and natural resources conservation and cultural and heritage sites. The majority of the impacts will occur only during project construction. The related mitigation measures which are available for these limited impacts are presented in Table 6.

Table 6: Matrix of Potential Environmental Impact and Possible Mitigation Measures: Road and Highway

Issue	Mitigation measures	Significance	Duration	Who responsible?		Monitoring/management
				Construction	Implementation	
1. Recommendation during project design						
Loss of roadside trees	<ul style="list-style-type: none">- Tree clearing should be avoided as much as possible, and if unavoidable, the damaged trees need to be replaced by re-planting new road side trees.- Incorporate replacing damages in project costs- Consult communities in project design and public awareness.	D2	Medium term	Engineer – include costs of tree planting in project design	Engineer	Environmental Specialist (ES), IA, EA,
Loss of natural trees /protected area for borrow pits	<ul style="list-style-type: none">- Develop alternative uses for borrow pit areas where is not negative impact on livelihood and protected areas- Incorporation of replacing damages during project design.	D2	Medium term	Engineer	Engineer/ Contractor	ES, IA, EA
Loss of agricultural land for borrow pits	<ul style="list-style-type: none">- Develop alternative uses for borrow pit areas where is not negative impact on livelihood and protected areas.- Incorporation of replacing damages during project design.	D2	Long term	Engineer	Engineer/ Contractor	ES, IA, EA
Land mine and UXO	<ul style="list-style-type: none">- Subprojects will rehabilitate existing roads without widening. Nevertheless, risks remains since there may be deep seated mines that could be exploded by heavy construction equipment, etc.- Hence 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.	D3	Medium term	Contractor	IA	ES, IA, EA
Relocation or assets affected	<ul style="list-style-type: none">- Engineer should design to avoid or reduce any impact on assets (individual or community).- Ensure compliance with the resettlement framework of the Project and Cambodian laws, policies, and regulations.	D2	Long term	Engineer IA/ EA	Engineer IA/ EA	ES, IA, EA
2. Recommendation during construction phase						
Dust from road works	Water shall be sprayed during construction, particularly in towns and villages, to ensure that dust is minimized throughout the construction zone.	D3	Short term	Contractor	Contractor	IA/EA/ES to check the site during construction

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Issue	Mitigation measures	Significance	Duration	Who responsible?		Monitoring/ management
				Construction	Implementation	
						interview locals etc.
Dust, odor and dry material handling	Dry material handling and transport generate large amounts of dust thus: (a) The Contractor shall prepare a dust control program. (b) Water shall be sprayed where dry materials are handled, crushed and transported. (c) Vehicles transporting materials are to be covered to reduce spills and dust.	D2	Short term	Contractor	Contractor	ES, IA, EA
Air pollution and noise	<ul style="list-style-type: none"> - vehicles and equipment are to be maintained to meet Cambodian emission and noise standards to limit emissions that cause air pollution and noise - Construction to cease within 100m of a village or town during lunch hours and night time. 	D2	Short term	Contractor	Contractor	ES, IA, EA
Human waste from construction	Provision of sanitary facilities (toilets, etc.) with proper waste disposal will be provided by contractors	D2	Short term	Contractor	Contractor	ES, IA, EA
Solid waste generation from construction camp, work sites and workers	Sufficient garbage containers are to be provided in construction camps and at work site, and be emptied daily, the waste being disposed of in an approved landfill or site to avoid solid waste creating a nuisance and encouraging disease vectors (such as flies and rats) or blocking drainage system and hazard to human health and environment. Every camp and work site to be cleaned before moving to new sites.	D2	Short term	Contractor	Contractor	ES, IA, EA to check & observe the construction areas and camp sites
Traffic and transport of equipment	Construction vehicles will comply with national speed limit and will drive at low speeds, especially at markets, schools, hospitals, and urban /populated areas.	D2	Short term	Contractor	Contractor	ES, IA, EA
Traffic congestion	Keep road space or bypass for travellers to avoid traffic jams, and construction vehicles to be parked at designated safe places.	D2	Short term	Contractor	Contractor	ES, IA, EA to check & observe trucks, pit soil piles, & other equipment at construction area
Traffic accidents	Put up construction signs for public, safety first signs at the construction area, and place suitable barriers around works sites	D2	Short term	Contractor	Contractor	ES, IA, EA

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Issue	Mitigation measures	Significance	Duration	Who responsible?		Monitoring/management
				Construction	Implementation	
	to prevent people or animals going onto the site.					
Soil erosion	Eroded material from embankments and borrow pits can block ditches and culverts, damage adjacent land & cause deterioration in water quality. The alternative approaches should be: (1) provide adequate across drainage to avoid over flow or flooding, and (2) re-vegetation of construction area to reduce runoff and flow.	D3	Long term	Contractor	Contractor	ES, IA, EA
Water contamination	The most severe water quality impact would be from bitumen, diesel or waste oil. Since these substances are toxic to living organisms, the following will observed: <ul style="list-style-type: none"> - Diesel and waste oil are to be handled and stored carefully to prevent leakage or spill. Waste oil is to be collected, stored and disposed at approved sites (according to national standard). - 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. - 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. 	D2	Short term	Contractor	Contractor	ES, IA, EA
Loss of trees	Tree clearing should be avoided as much as possible and tree planting carried out where appropriate in order to enhance the environments around the road.	D2	Long term	Contractor	Contractor	ES, IA, EA
Worker safety and health	<ul style="list-style-type: none"> - Workers should wear protection equipment during work time to ensure that they are safe and good health. - A contractor should develop a health and safety plan. M - Manager should educate workers on health & safety projection. 	D3	Short term	Contractor	Contractor	ES, IA, EA
Transmission of sexually communicable diseases	<ul style="list-style-type: none"> - Provide sanitation and portable water. - Education of workers on transmittable diseases. 	D3	Long term	Contractor	Contractor	ES, IA, EA
Stagnant water areas	Siting camps distant to communities and removal of still water areas	D2	Long term	Contractor	Contractor	ES, IA, EA

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Issue	Mitigation measures	Significance	Duration	Who responsible?		Monitoring/ management
				Construction	Implementation	
(breeding mosquitos)						
3. Recommendation during operational phase						
Traffic accident	<ul style="list-style-type: none"> - Provide traffic sign board at corner or curve road, especially at school, hospital and market areas. - Road safety device including traffic sign board (especially at corner or curve road and school, hospital and market centers) and speed bump (for reducing speed, especially at hospital, market and school areas). - Public awareness and campaign on traffic sign and national traffic regulation to educate communities to get understanding on the traffic thus the traffic accident will be reduced or avoided. 	D3	Long term	Contractor (Cost of the sign boards should be incorporated by Engineer) IA, EA	IA, EA	IA, EA, local Authorities

Note: D1 = Not significant, D2 = small impact, D3 = moderate impact, D4 = big impact; Short term = less than 1 year, medium term = 1 to 5 years, long term = More than 3 year.

3. Environmental issues related to project design

a. Loss of road side tree and natural forest (D2)

55 Although the project will only restore roads that were damaged from flooding, there is still the potential for impact on trees and natural forest if:

- (i) Trees immediately adjacent to the works are affected minimally by the reconstruction; and
- (ii) Areas in primary natural forest are selected for borrow pits for sub-base material.

Mitigation: Ensure there are acceptable alternative borrow pit areas that would have an overall beneficial advantage in terms of improved livelihood and reduced environmental impact. The borrow pits will need to be re-vegetated before being handed back to the owner, or may be adopted as fish ponds.

Monitoring: i. Detailed Design; Evolve acceptable concepts and designs in consultation with communities. Responsibility: EA/IA/Consultant.

ii. Construction: Check Contractor's work monthly. Responsibility: EA/IA/Consultant.

b. Relocation or impacts on some assets (D2)

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

Mitigation: The design should maximize benefits or avoid impacts on assets (individual or community) and ensure compliance with the resettlement framework of the Project and Cambodian laws, policies, and regulations.

Monitoring: i. Detailed Design; Acceptable concepts and designs will need to be further evolved together with the villagers. Responsibility: EA/IA/Consultant.
ii. Construction: Checking Contractor's work. Responsibility: EA/IA/Consultant.

c. Environmental issues related to project construction

Dust Impacts (D3)

57 Dust from transportation of construction materials to site and road works during construction will be a problem to communities who live along roads, especially during dry season. The dust will impact on aesthetics and public health through breathing and polluting water quality.

Mitigation: The Contractor will be required to have a dust abatement program that includes spraying water on roads and work areas within villages and houses that may be located close to the road.

Dry material handling and transport generates large amounts of dust thus:

- *The Contractor shall prepare a dust control program;*
- *Water shall be sprayed where dry materials are handled, crushed and transported; and*
- *Vehicles transporting materials are to be covered to reduce spills and dust.*

Monitoring: IA/EA/ES Monthly (Monitor should check at the site during construction and also interview with villagers, teacher etc.)

Noise Impacts (D2)

58 Construction equipment may cause temporary and localized noise and vibration generation. Sources of noise include transportation of material, vehicle and equipment used at the road work site. These will impact on communities close to work areas.

Mitigation: The Contractor will need to ensure that construction within 100m of a village or town is limited to avoid lunch hours and night time.

Monitoring: Contractor/IA/EA, monthly.

Human wastes from construction (D2)

59 Sources of the human waste will be generated by workers that will impact on environment and public health in the communities around the work site.

Mitigation: Provision of sanitary facilities (toilets, etc.) with proper waste disposal to be provided by contractors.

Monitoring: Contractor/IA/EA, monthly.

Solid waste (D2)

60 Solid waste includes residue from construction material and worker's eating food and drinking, generating plastic bags, white styrofoam plastic from food package, plastic bottles and glass bottles. Solid waste can create nuisance, encourage disease vectors (such as flies and rats), block drainage system and be a hazard to human health and environment.

Mitigation: Contractor should ensure that (i) sufficient garbage containers are provided in construction camps and at work sites, 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.

Monitoring: Contractor daily, IA/EA monthly (Monitor should check at the Camp Site during stay and after moving out).

Traffic congestion and transport of equipment (D2)

61 Traffic congestion normally occurs due to illegal inconsiderate parking of equipment and the piling of soil for road construction.

Mitigation: Contractor should ensure that: (i) drivers of construction vehicles comply with national speed limits; (ii) construction vehicles drive at low speeds, especially through market, school, hospital, urban areas; (iii) maintain adequate clear road space or bypass for travelers to avoid traffic jams; and (iv) park construction vehicles at designated safe places.

Monitoring: Contractor daily; IA/EA, monthly.

Traffic accident (D2)

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

Mitigation: Contractor should: (i) Put construction signs, (e.g. safety first), at the construction area and put wire fences around works sites to protect people or animals from entering the site; (ii) Construction vehicles must comply with national speed limits; (iii) Construction vehicles will drive at low speeds, especially near markets, schools, hospitals, in urban areas; and (iv) Construction vehicles should park at designated safe places.

Monitoring: Contractor daily; IA/EA monthly.

Worker's Safety and Health (D2)

63 Accidents inevitably happen and when they do the Contractor will need to have an effective Worker Health and Safety Plan that is supported by trained first aid personnel and emergency response facilities.

Mitigation: Preparation of a Worker Health and Safety Plan

Monitoring: Contractor daily, IA/EA monthly.

Soil erosion (D3)

64 The potential for soil erosion occurs normally during clearing embankments and earthworks on excavated areas and placing new soil cover. These may cause sediment run off to a water body due to rainfall and will block ditches and culverts, damage adjacent land and cause deterioration in water quality.

Mitigation: The contractor will be required to implement soil and erosion controls to minimize soil erosion and sedimentation of waterways. The alternative approaches should be; (i) provide adequate cross drainage to avoid over flow or flooding; and (ii) re-vegetation of construction areas to reduce runoff and flow.

Monitoring: IA/EA monthly.

Water contamination (D2)

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

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

Monitoring: Contractor daily; IA/EA monthly.

Loss of tree (D2)

66 The project will only improve the existing roads where damaged during flooding, so there shall be minimal impact on some trees and/or branch of trees.

Mitigation: 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.

Monitoring: IA/EA monthly.

Transmission of sexually communicable diseases (D3)

67 HIV/AIDS is still prevalent in Cambodia thus it may happen through workers from various provinces.

Mitigation: Preparation of Health Plan and Education of workers on transmittable diseases.

Monitoring: IA/EA monthly.

Stagnant water areas (breeding mosquito victors) (D2)

68 Stagnant water can create habitats for mosquito vectors that may remain in borrow pits, wastewater and in discarded solid waste such as old tires, plastics and containers that may be disposed by workers around worker camps. Borrow pits and other excavation areas are unlikely to be a major problem as any water that is caught in them is expected to be turbid and unsuitable for the malarial mosquito larvae to breed in.

Mitigation: Contractor must ensure that (i) solid waste disposed into safe landfill. (ii) Siting camps distant to community's and removal of stagnant water areas, and (iii) borrow pits may be converted to ponds for fish raising or water storage for community utilization.

Monitoring: Contractor daily; IA/EA monthly.

d. Environmental problem related to project operation

Traffic accident (D3)

69 As a result of the improved road, it will be possible for vehicle speeds to increase from an average of about 30 kph to possibly 100+ kph. This will consequently increase road accidents on a largely unskilled driver population. With higher speeds drivers, passengers, pedestrians and livestock will be increasingly involved in accidents.

Mitigation: Some measures to improve road safety are :

- (i) Provide traffic sign boards at corner or curved roads, especially at near school, hospital and market areas.
- (ii) Road safety device such as speed bump (for reducing speed, especially at hospital, market and school areas).
- (iii) Public awareness and campaign on traffic signs to educate communities to gain understanding on traffic.

Monitoring: local authority daily; IA/EA monthly for 1 year after road completion for construction.

4. Potential positive environmental and social impacts

During project construction:

70 **Livelihood/income (+D3):** A key positive impact will be the 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:

71 **Easier Transport at Reduced Costs (+D3):** The improvement of the road surface and new bridging will reduce travel time and transport costs. It will improve access to services, especially access to medical facilities. Monitoring will not be needed.

72 **Livelihood/Income (+D3):** The improvement of the roads will reduce cost of travelling and provide access to services and transportation of local products to market. Monitoring will not be needed

73 **Improved public access (+D3):** The improved road will provide benefits by improving road access to services for local communities, especially access to hospital, governmental services and markets.
Monitoring: not needed.

VI. Information Disclosure, Consultation and Participation

74 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.

75 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.

76 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 community.

VII. Grievance Redress Mechanism

77 The objective the grievance redress mechanism is to resolve complaints as quickly as possible and at the local level through a process of conciliation; and, if that is not possible, to provide clear and transparent procedures for appeal. A well-defined grievance redress and resolution mechanism will be established to resolve grievances and complaints in a timely and satisfactory manner. All affected persons will be made fully aware of their rights, and the detailed grievance redress procedures will be publicized through an effective public information campaign. The grievance redress process includes four stages:

78 First stage: Complaints and grievances will be provided verbally or in writing to the village chief, commune chief or field PIU staff. The receiving agent will provide immediate written confirmation of receiving the complaint. If after 15 days the complainant does not hear from the village and commune chiefs or field PIU staff, or if he/she is not satisfied with the decision taken in the first stage, the complaint may be brought to the District Office.

79 Second stage: The District Office has 15 days within which to resolve the complaint to the satisfaction of all concerned. If the complaint cannot be solved at this stage, the District Office will bring the case to the Provincial Grievance Redress Committee.

80 Third stage: If the aggrieved affected household does not hear from the District Office or is not satisfied, he/she can bring the case to Provincial Court. The Court will make a written decision and submit copies to the executing agency and implementation agencies. If any party is still unsatisfied with the Provincial Court judgment, he/she can bring the case to a higher-level court.

81 Safeguard monitoring reports will include the following aspects pertaining to progress on grievances: (i) number of cases registered with the Grievance Redress Committee (GRC), level of jurisdiction (first, second and third tiers), number of hearings held, decisions made, and the status of pending cases; and (ii) lists of cases in process and already decided upon may be prepared with details such as Name, ID with unique serial number, date of notice, date of application, date of hearing, decisions, remarks, actions taken to resolve issues, and status of grievance (i.e. open, closed, pending).

82 All costs involved in resolving the complaints (meetings, consultations, communication and reporting / information dissemination) will be borne by the PCMU.

83 ADB's Accountability Mechanism² will also be explained to affected households.

VIII. Environmental Management Plan

84. 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.

85. 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 Office (SEO) during Project implementation. PCMU /SEO 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.

86. 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.

87 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

²<http://beta.adb.org/site/accountability-mechanism/main>
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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.

88 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 Attachment 1.

89 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.

90 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.

IX. Conclusion and Recommendation

91 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 in overall benefits to communities in terms of livelihoods and connection between community and community, especially students, pregnant women and ill people can easily gain access to school and hospitals in time.

92 During construction a series 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. As for operational stages, the benefit includes improving community livelihood, public health, tourist access and general amenity.

93 In order to reduce adverse impacts, the following alternative approaches are recommended:

- 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 Attachment 2)

Initial Environmental Examination

- 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.

94 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.

Attachment 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	Metal industries	
1.	Mechanical industries	All sizes
2.	Mechanical storage factory	All sizes
3.	Mechanical and shipyard enterprise	All sizes
VIII	Metal Processing Industrials	
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	Other Industries	

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

ATTACHMENT 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.

Attachment 3: Environmental Management Plan

The Environmental Management Plan will be part of the General Conditions of Contract (Appendix 2) and will take precedence in any conflict with General Specifications.

This item will not be measured and instead will be assessed by the Engineer if the Contractor has successfully met all the Specifications requirements.

No separate payment shall be made with respect to compliance with the provisions of the Environmental Management Plan. The Contractor shall be deemed to have made allowances for such compliance with these provisions in the preparation of his prices for items of work included in the Bill of Quantities period.

The contractor has to incorporate the environmental management plan into account for high consideration to compliance with Cambodian Policy and ADB safeguard policy.

The EMP below is a general guide for the contractor to follow. After appointment and mobilization of 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 pit areas; road areas, workers camps and other facilities. This must be submitted to the Supervising Consultant for their approval before works commence.

Compliance monitoring reports will be submitted by the contractor to PIU of MRD and DDIS Consultant on a monthly basis.

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'	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 should be covered with tarpaulin 	Contractor	DDIS Consultant, IA/EA

Project Phase	Project Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities	
				Implement	Supervise
	camps, borrow pit operation, hauling of construction wastes to spoil sites		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 	Contractor	DDIS Consultant, IA/EA

Project Phase	Project Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities	
				Implement	Supervise
			ensure adequate cleanup of any 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 pit operators. There will be no side borrow pits permitted, unless agreed to with roadside residents. The contractor will be responsible for rehabilitating any borrow pit sites opened and operated by them 	Contractor	DDIS Consultant, IA/EA

Project Phase	Project Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities	
				Implement	Supervise
		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. • Tree planting should be carried out in the appropriate location of the road. Coordinate with MoE regarding the species of trees to be used. 	Contractor	DDIS Consultant, IA/EA
		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

Project Phase	Project Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities	
				Implement	Supervise
		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 trained first aid personnel and health facility should be provided on site. • 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. 	Contractor	DDIS Consultant, IA/EA

Project Phase	Project Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities	
				Implement	Supervise
		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. 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 	Contractor/in coordination with the sub-district officials	DDIS Consultant, IA/EA
		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

Project Phase	Project Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Institutional Responsibilities	
				Implement	Supervise
		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 traffic signs	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

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