

# Initial Environmental Examination

---

July 2012

## Cambodia: Flood Damage Emergency Reconstruction Project

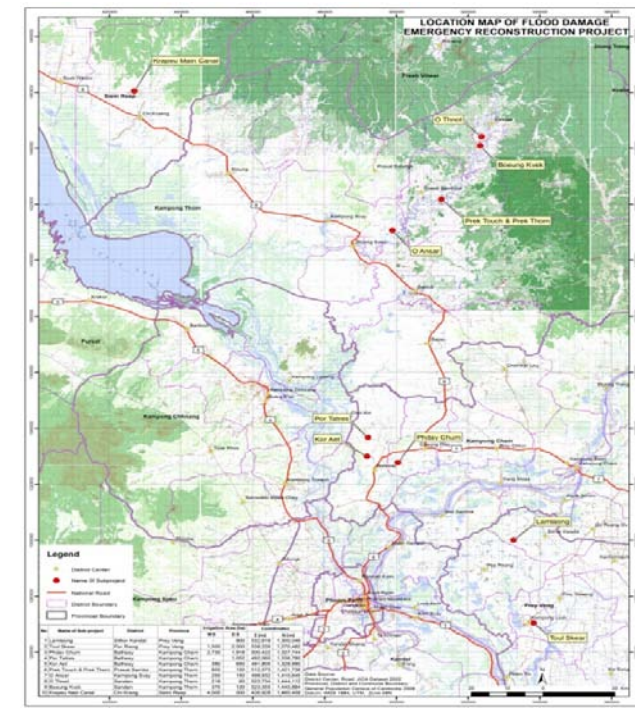
Prepared by Ministry of Water Resources and Meteorology for the Asian Development Bank.

This initial environmental examination is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature.

In preparing any country program or strategy, financing any project, or by making any designation of or reference to a particular territory or geographic area in this document, the Asian Development Bank does not intend to make any judgments as to the legal or other status of any territory or area.

# Initial Environmental Examination of Irrigation Restoration

ADB LOAN NUMBER: 2852-CAM(SF)  
AUSAID GRANT NUMBER: 0285-CAM (EF)



## Cambodia: Flood Damage Emergency Reconstruction Project

October 2012

## ABBREVIATIONS

ADB	-	Asian Development Bank
AP	-	Affected People
BTB	-	Battambang
CAR	-	Corrective Action Report
CTDP	-	Corridor Town Development Project
EA	-	Executive agency
EARF	-	Environmental Assessment and Review Framework
EIA	-	Environmental Impact Assessment
EMP	-	Environmental Management Plan
ES	-	Environmental Specialist
FDERP	-	Flood Damage Emergency Reconstruction Project
GRM	-	Grievance Redress Mechanism
ha	-	hectare
IA	-	Implementing agency
IEE	-	Initial Environmental Examination
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
O&M	-	operation and maintenance
PCMU	-	Project Coordination and Monitoring Unit
PIU	-	Project Implementation Unit
SPS	-	Safeguard Policy Statement
UXO	-	Unexploded ordnance
WB	-	World Bank

## **Contents**

A. INTRODUCTION .....	4
B. DESCRIPTION OF PROJECT .....	4
C. DESCRIPTION OF THE ENVIRONMENT .....	7
D. SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES .....	14
E. INSTITUTIONAL REQUIREMENTS AND MONITORING PROGRAM .....	29
F. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION .....	30
G. GRIEVANCE REDRESS MECHANISM .....	30
H. CONCLUSION AND RECOMMENDATION .....	31
APPENDIX 1: ENVIRONMENTAL AND SOCIAL MONITORING REPORT OUTLINE .....	34

## **Tables**

TABLE 1: TEMPERATURE IN SIEM REAP STATION, 2005 .....	8
TABLE 2: DESCRIPTION OF THE PROTECTED AREAS ADMINISTRATED BY THE MOE .....	11
TABLE 3: FISH COMMONLY FOUND IN THE TONLE SAP AND FLOODPLAIN AREA .....	12
TABLE 4: POPULATION AND ADMINISTRATIVE STATISTICS .....	12
TABLE 5: STATUS OF EMPLOYMENT .....	13
TABLE 6: MATRIX OF POTENTIAL ENVIRONMENTAL IMPACT AND POSSIBLE MITIGATION MEASURES: IRRIGATION .....	15

## **Figures**

FIGURE 1: LOCATION MAP OF TEN SUBPROJECTS .....	6
FIGURE 2: GEOLOGICAL MAP .....	7
FIGURE 3: ANNUAL RAINFALL IN VARIN STATION .....	8
FIGURE 4: AVERAGE RAINFALL IN VARIN STATION .....	9
FIGURE 5: DISTRIBUTION OF ANNUAL RAINFALL IN CAMBODIA .....	9
FIGURE 6: LAND COVERS CONTEX .....	10
FIGURE 7: POVERTY MAP OF CAMBODIA .....	13

## A. Introduction

1. The Asia Development Bank (ADB) and the Royal Government of Cambodia (RGC) has agreed to implement the Flood Damage Emergency Reconstruction Project (FDERP), which will be financed by a project loan from the ADB and grant for the Australian Government. 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 irrigation 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.

## B. Description of the Project

4. 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 ten subprojects for this stage 3:

- (i) **Irrigation and flood control.** Under this output, about 10 flood damaged irrigation schemes covering about 7,400 hectare (hain dry season) will be repaired in at least 4 provinces, Prey Veng, Kampong Cham, Kampong Thom, and Siem Reap. In Stage 1, works involved temporary measures completed during 2011 to restore irrigation as far as possible. It is proposed to complete relatively small scale in Stage 2 works, before the 2012, wet season in 19 schemes to restore most of the irrigation operation, and to secure undamaged works for the next wet season. Stage 3 covers many works that require more detailed investigations, and theses works will commence after the 2012 wet season in 10 schemes for priority, named Lamlaong, ToulSkea, Phdav Chum, PorTatres, KorAet, Krapeu Main Canal, Prek Touch & Prek Thom, O Ansar, O Thnot and BoeungKvek (see location map on Figure 1). The Main works of these subprojects are dyke or embankment reconstruction.

- i. **Subprojects in Prey Veng province:**

- 1) **Lamlaong subproject:** *The subproject is reconstructed only spillway for this Stage 3. Most of construction and structures already constructed in stage 2 before 2012. This scheme is approximately 55 km north of Prey Veng Town. It locates in Lamlaong village, ChreyKmum commune, SithorKandal district, Prey Veng province.*
    - 2) **ToulSkea subproject:** *The subproject is reconstructed only structure of drainage for this stage 3. Most of construction and structures already constructed in Stage 2 before 2012. The ToulSkear canal system is approximately 2 km to the east of Prey Veng town. It locates comprising two communes Ta Kor and Me Bon communes in Prey Veng District in PreyVeng Province.*

ii. **Subprojects in Kampong Cham province:**

- 1) **Phdav Chum subproject:** The subproject consists of the dyke reconstruction about 17,000 meters length and 4 meters width. This dike is playing important roles to protect the flood during rainy season. It locates approximately 5 km to the South of Cheung Prey district town (Skun). This scheme comprises 7 communes namely Batheay, Pha-Av, Kouk Roveng, Khnaor Dambong, Phdau Chum, Prey Char, and Soutip in Cheung prey and Batheay district, Kampong Cham Province.
- 2) **PorTatres subproject:** The subproject consists of the dyke reconstruction about 6,000 meters length with 4 meters width. It locates in two communes namely TaingKrasang and Trob in Batheay district, Kampong Cham Province.
- 3) **KorAet subproject:** The subproject consists of the rehabilitation and reconstruction of retention dyke about 3,600 meters length with 4-5 meters width. This subproject will also rehabilitate main canal 1,550 meters, drain canal 400 meters and parallel canal 4,550 meters. This subproject locates in Tang Roleang, Tang Thlaeng and Prey Kaor of Me Pring commune, Batheay District, Kampong Cham province. This retention dyke is playing important roles to protect the flood during rainy season. Then, this system will also store water for cultivating in dry season.

iii. **Subproject in Siem Reap province:**

- 1) **Krapeu Main Canal subproject:** The subproject consists of the main canal rehabilitation about 8,500 meters length with 4-5 meters width. Alternatively, left and right embankments will also be constructed along this main canal. It is in two communes namely KoukThlokLeu and KoukThlokKraom, Chi Kreng District, Siem Reap province.

iv. **Subprojects in Kampong Thom province:**

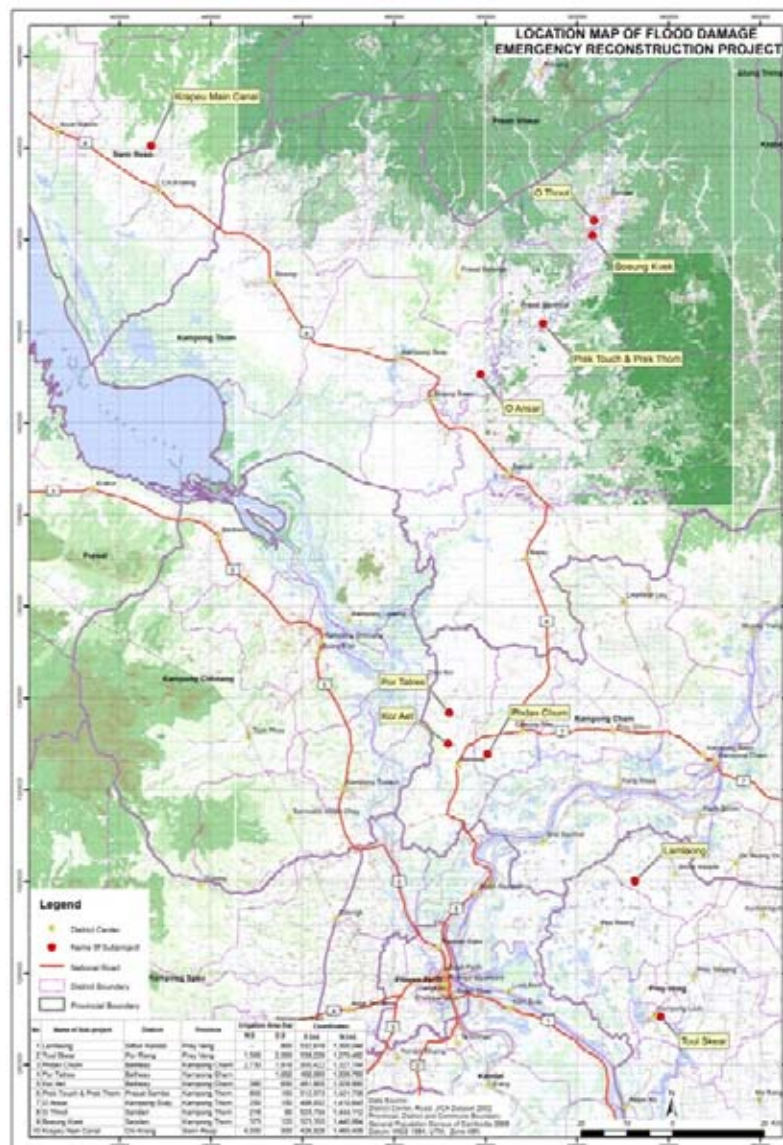
- 1) **Prek Touch & Prek Thom subproject:** The subproject consists of the dyke reconstruction about 2,070 meters length with 4 meters width. It is in 2 villages, named Teok Andong and Chhuk Boeng, in Chhuk commune, Presat Sambo District, Kampong Thom province. This dike will form a shallow reservoir for recession rice crop. It locates approximately 40 km to the East of Kampong Thom town. Moreover, this dike will also be used as road to link TeokAndong and Chhuk Boeng village. Thus, people of these villages are able to transport their agricultural yield to market easily.
- 2) **O Ansar subproject:** The subproject consists of the dyke reconstruction about 700 meters length with 4 meters width. This dyke is in Tiem Chas village, Kampong Svay commune in Kampong Svay District, Kampong Thom province. It locates approximately 15 km to the East of Kampong Thom town. This dyke will store water for farmers to cultivate in dry season.
- 3) **O Thnot subproject:** The subproject consists of the dyke reconstruction about 2,700 meter length with 4 meters width. It is located approximately 70 km to the East of Kampong Thom town and it also locates about 8 km to the South of the Sandan District, Kampong Thom province. It is in 2 villages, named O Thnot and Krabei Prey, in Ngan commune, Sadan District, Kampong Thom province. This embankment/dyke is playing important roles to protect the flood during rainy season. Then it will store water for cultivation in dry season. Also, this dike will be used as road to link O Thnot and Krabei Prey village.
- 4) **Boeung Kvek subproject:** The subproject consists of the dyke

reconstruction about 700 meters length with 4 meters width. It locates approximately 70 km to the North-East of Kampong Thom town and it also is located about 10 km to the South of Sandan District. It is in a village, named Veal Pring Kraom, in Chheu Teal commune, Sandan District, Kampong Thom province. This embankment/dyke is playing important roles to protect the flood during rainy season. Then it will store water for cultivation in dry season.

- (ii) **Project and flood management.** This output will support the EA to undertake overall oversight and management of the project and ensure that procedures are followed and that the implementation schedules are kept on track. This output will also provide consulting and capacity development inputs to link the restoration outputs under the project with support for flood management activities.

5. This IEE includes the preparation of environmental assessments and environmental management plans (EMPs).

**Figure 1: Location Map of Ten Subprojects**





## C. Description of the Environment

### 1. Physical environment

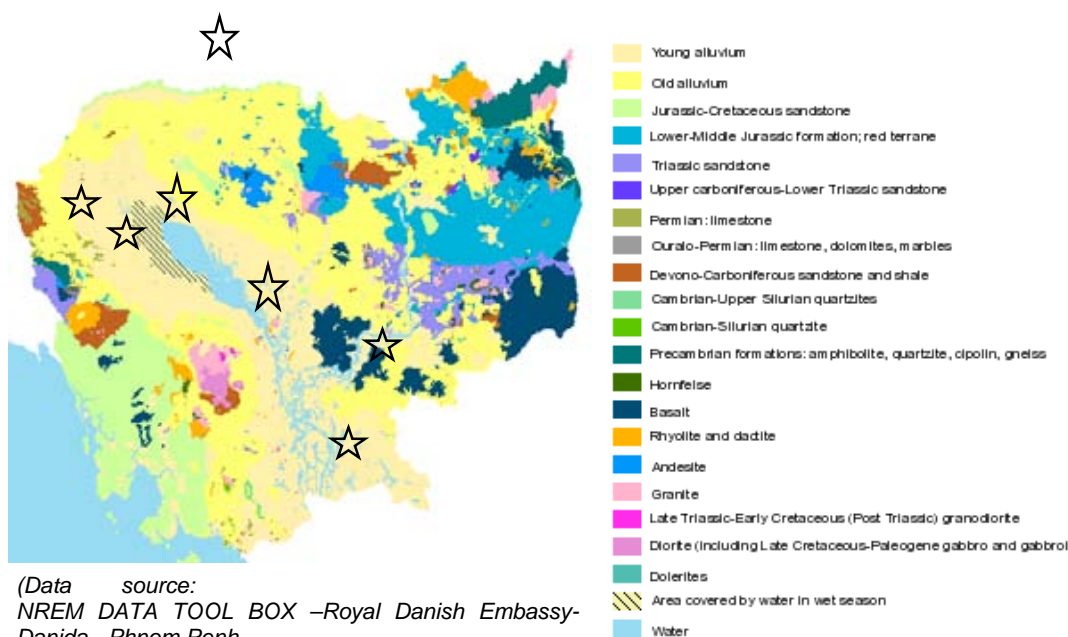
#### Topography, geology and soil

6. Cambodia is bordering with Thailand to the northwest and west, Laos to the north, and Vietnam to the northeast & east and the Gulf of Thailand to the southwest. Cambodia has twenty four provinces and capital city. The selected provinces of the project are Siem Reap, Kampong Cham, Prey Veng and Kampong Thom where located in floodplain of the lower Mekong River Basin in Cambodia.

7. 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 as above the plain. 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.

8. The geology of the Prey Veng areas is characterized by young alluvium soils (see geological map in **Figure 2** 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 2: Geological Map**



#### Climate

9. 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. The climate of the study areas comes under tropical monsoon as other place in Cambodia with two main seasons, rainy and dry season with duration of six months for each. In 2005, the mean annual temperature is 28.2°C: the mean maximum temperature



is above 36.6°C in April throughout the year and is normally highest in March to May, and the mean minimum temperature is 19.8°C in January. According to the PreyVeng, Kampong Cham, and Kampong Thom, they are located in floodplain areas like Siem Reap thus the wind effluence, temperature and rainfall are quite similar. So, the minimum and maximum temperatures in Siem Reap station were presented in Table 1 below.

(a). Temperature

**Table 1: Temperature in Siem Reap Station, 2005**

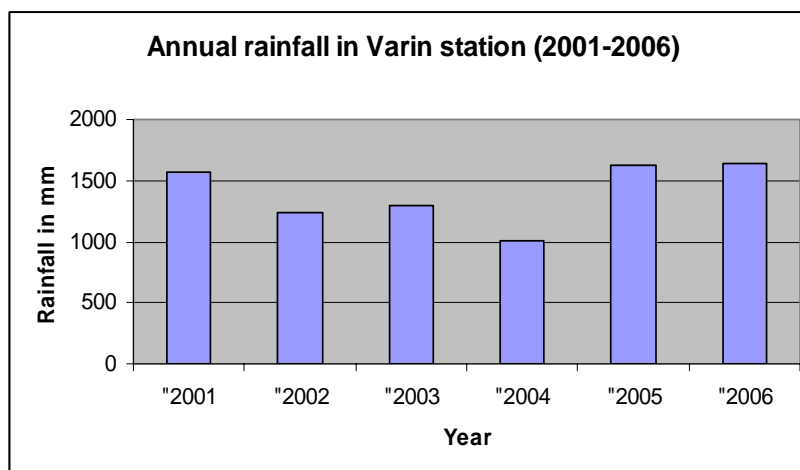
No.	Month	Temperature (min) (°C)	Temperature (max) (°C)
1	January	19.8	31.4
2	February	23.0	33.9
3	March	22.7	34.8
4	April	25.5	36.6
5	May	25.9	35.8
6	June	24.2	32.5
7	July	24.8	32.2
8	August	24.7	32.4
9	September	24.8	31.7
10	October	23.9	31.6
11	November	23.1	31.7
12	December	20.8	29.6
<b>Average</b>		<b>23.6</b>	<b>32.8</b>

Source: Department of Water Resources and Meteorology, Siem Reap

10. The average annual rainfall in the past 6 years (2001-2006) in Varin Station is about 1396 mm, (data from PDOWRAM office in Siem Reap). The monthly rainfall in Varin station showed in figure 4, September is highest rainfall in the project area (322mm). The rainy season occurs during the southwest monsoon from May to October, and the northeast monsoon brings drier and cooler air from November to March, then hotter conditions prevail in April and early May producing a pronounced dry season. According to the PreyVeng, Kampong Cham, and Kampong Thom, they are located in floodplain areas like Siem Reap thus the wind effluence, temperature and rainfall are quite similar.

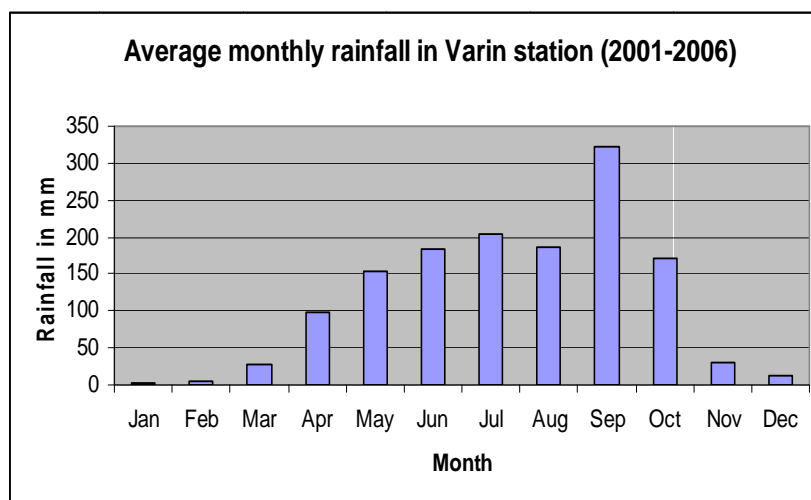
(b). Rainfall

**Figure 3: Annual rainfall in Varin Station**



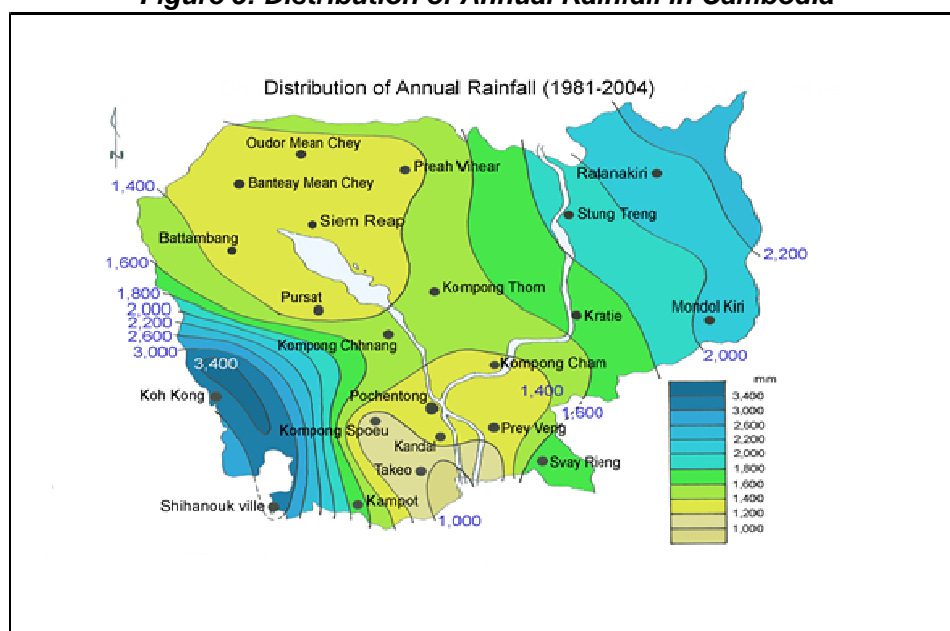
Source: Department of Water Resources and Meteorology, Siem Reap

**Figure 4: Average rainfall in Varin Station**



Source: Department of Water Resources and Meteorology, Siem Reap

**Figure 5: Distribution of Annual Rainfall in Cambodia**



**Source:** Department of Meteorology, Ministry of Water Resources and Meteorology

## Water resource

11. According to the JICA data set (2002), the hydrology of the project area, especially Siem Reap is determined by three systems: (i) the hydrological conditions that prevail in the upper catchment areas of the Koulen mountain escarpment as modified by the nearly level plain area that surrounds the road and is evident as channelised flow in the 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 Siem Reap and Stueng Chi Kraeng, 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.

12. 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. However, for subprojects in Kampong Thom, 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 Tonle Sap River.

### **Ground water**

13. 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**

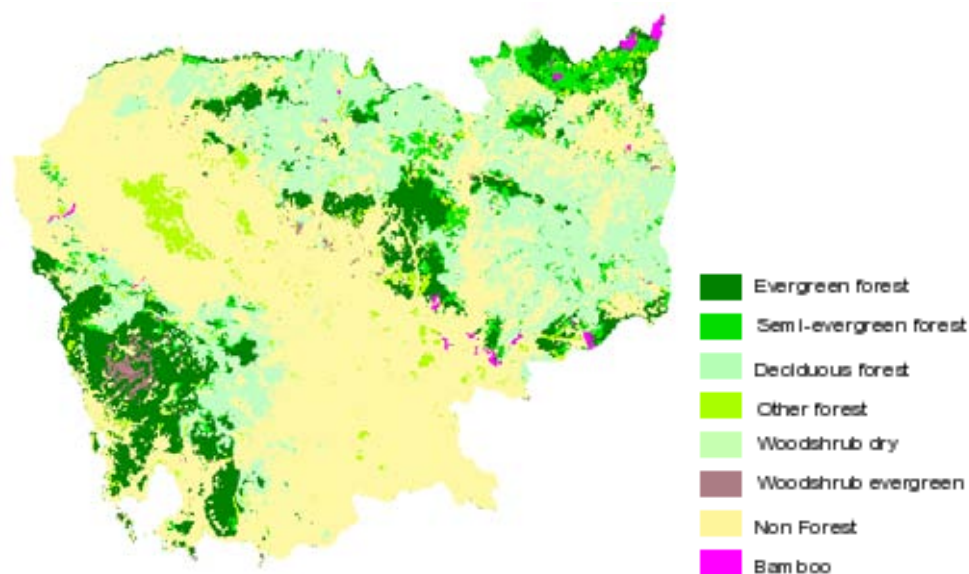
### **Forest and vegetation**

14. The natural forest in project areas has almost completed. The land areas are dominated by agricultural land (see **Figure 6** below). Agricultural activities including rice filed and vegetation are increasing in the project areas. The proposed sites of road improvement are not close to any sensitive projected 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**

15. 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 6: Land covers contex**



Source: CTD, 2012

### **Protected areas**

16. 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, only Kampong Thom and Siem Reap (**Table 2**). This law doesn't create any protected areas in Prey Veng, and Kampong Cham yet in 1993 (Table 2).

17. 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 the 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.

**Table2: Description of the protected areas administrated by the MOE**

<b>Protected area</b>	<b>Surface area (ha)</b>	<b>Province</b>
<b>Natural Parks: 871,250 ha</b>		
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
Ream	150,000	Sihanouk-Ville
Virachey	332,500	StuengTreng and Rattanakiri.
<b>Wildlife Preserves: 2,030,000 ha</b>		
Boeng Per	242,500	Kampong Thom
Kulen Promtep	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
Roneam Donsam	178,750	Battambang
Snoul	75,000	Kratie
<b>Protected scenic view areas: 500,950 ha</b>		
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)

## **Wildlife**

18. As given the above forest cover land, the wildlife is very rare in the project areas. Most of the areas are converted to be agricultural and residential. 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**

19. Fish are an important vitamin of 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 where are very essential of fish production. The production of the lake is estimated 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 has been found in the Lake and flood plain areas presented in the Table 3.

**Table 3: 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>Trichogaster trichopterus</i>	Migrates for breeding
TreiKamphleav	<i>Kryptopterus moorei</i>	Migrates for breeding
KanhChanhChras	<i>Pseudambassis notatus</i>	
KanhChos	<i>Mystus mysticetus</i>	Migrates for breeding
KanTrob	<i>Pristolepis fasciata</i>	
KhongVeng	<i>Dangil lineata</i>	Migrates for breeding
Kranh	<i>Anabas testudineus</i>	Migrates for breeding
Krosphnom	<i>Poropuntius deauratus</i>	Migrates for breeding
AngkatPrak	<i>Cyclocheilichthys microlepis</i>	
Slat	<i>Notopterus notopterus</i>	
Ta Aun/ Kramorm	<i>Ompok bimaculatus</i>	
SrakaKdam	<i>Cyclocheilichthys repasson</i>	Migrates for breeding

Source: GMS, 2002

### 3. Human and economic development

#### Population

20. 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 Siem Reap, Kampong Thom, Kampong Cham and Prey Veng have a population of 677,872; 896,443; 631,409; 1,679,992; and 947,372 persons.

**Table 4: Population and administrative statistics**

Province	District/town <sup>1</sup>	Commune <sup>1</sup>	Sangkat <sup>1</sup>	Village <sup>1</sup>	Total Population <sup>2</sup>
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

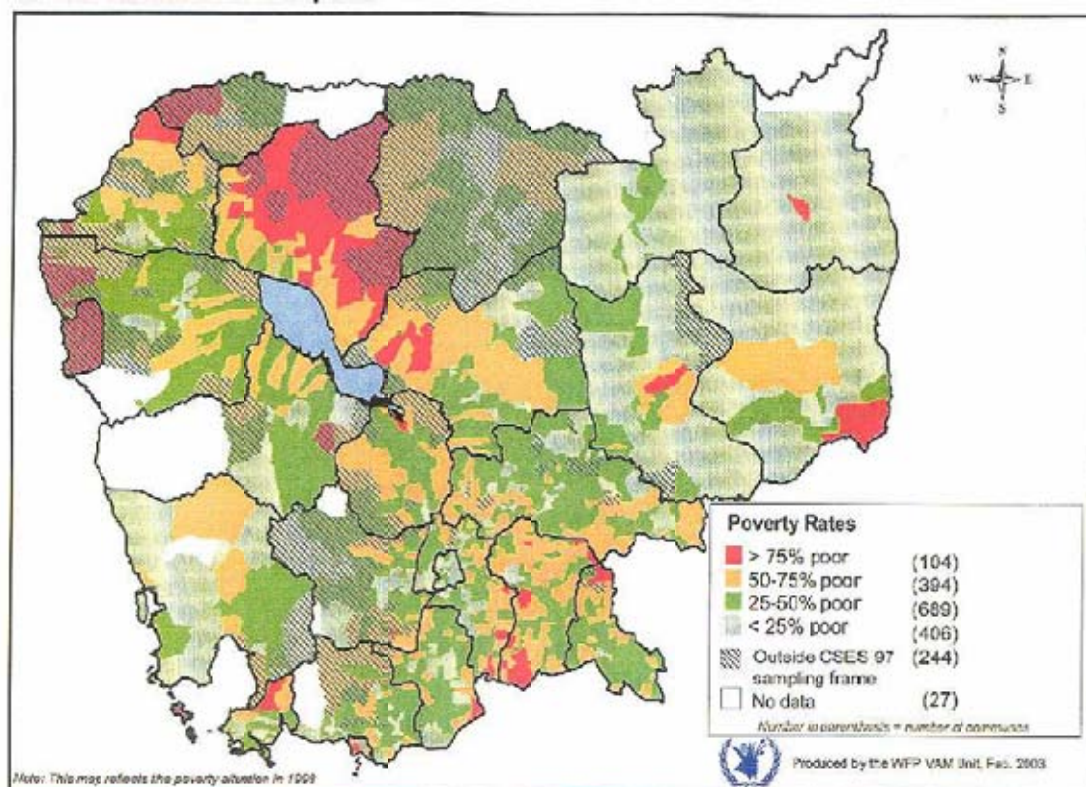
Sources: <sup>1</sup> Population Census (2008); <sup>2</sup> NCDD: <http://db.ncdd.gov.kh/>

#### Poverty

21. There is no source of information regarding exact number of poor people in these beneficiary and affected villages. According to the poverty map produced by the United

Nations World Food Programme in collaboration with the Ministry of Planning the area has a poverty rate of 25-50% as the following map.

**Figure 7: Poverty map of Cambodia**



(Source: United Nation World Food Programme)

## Employment

22. The economic and social development in a country depends on numbers of persons who are economically active.

23. 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).

**Table5: status of employment**

Status of employment	1998	2008
	Persons	Persons
<b>Total population in Cambodia</b>	<b>11,437,656</b>	<b>13,395,682</b>
Employment	4,845,762	6,935,246
Unemployment	273,183	118,152
<b>Urban Population</b>	<b>2,095,074</b>	<b>1,299,677</b>
Employment	761,998	1,233,174
Unemployment	95,235	58,337
<b>Rural Population</b>	<b>9,342,582</b>	<b>12,096,005</b>
Employment	4,083,764	5,702,072
Unemployment	177,948	59,815

Source: Population census (2008)

## **D. Screening of potential environmental impacts and mitigation measures**

### **1. *Environmental Assessment Methodology***

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

25. Impacts are analyzed in terms of 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

26. The impacts are also assessed according the duration of occurrence 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***

27. 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 irrigation construction.
- (iii) Operation: Occurring after completion of irrigation construction.

28. The list of potential impacts and mitigation measures identified for the Irrigation Improvement Project is discussed in **Table 6**. All of the works involves restoration of existing irrigation, so the impacts will be normal 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 only be during project construction. The related mitigation measures which are available for these limited impacts are also presented in Table 6.



**Table 6: Matrix of Potential Environmental Impact and Possible Mitigation Measures: Irrigation**

Issue	Mitigation measures	Significance	Duration	Who responsible?	Monitoring/management
<b>1. Recommendation during project design phase</b>					
<b>Protected areas</b>	- The subproject is not in protected areas, however, it may have some trees or vegetation along irrigation canal thus engineer should design to avoid damaging trees as possible.	D2	Long term	Engineer and Environment Specialist (ES)	Implementing Agency (IA)/Executing Agency (EA)/Environment Specialist (ES)
<b>Protection of cultural heritage</b>	- The subproject is not in Protection of cultural heritage area, however, project manager and engineer should pay attention to avoid damaging cultural and heritage sites and artifacts as possible.	D2	Medium term	Contractor/ES/APSARA Authority	IA/EA/ES
<b>Fish migration</b>	- Engineer should design to avoid or reduce any impact on fish migration. Water way for fish movement should be provided. The construction should be implemented during dry season.	D2	Short term	Engineer/ES	IA/EA/ES
<b>Downstream impact (water quantity)</b>	- Most of irrigation are challenging to water quantity, especially during dry season. The water remained mostly only during rainy season thus the downstream farmers have	D4	Long term	Engineer/ES	IA/EA/ES/Engineer

Issue	Mitigation measures	Significance	Duration	Who responsible?	Monitoring/management
	no enough water for crop or vegetation. Thus sources of water and storage capacity are very important for Engineer Consideration. Concepts of Integrated Water Resource Management (IWRM) should be applied.				
<b>Loss of natural trees/protected area for borrow pits</b>	- Develop alternative uses for borrow pit areas where is not negative impact on livelihood and protected areas.	D2	Medium term	Engineer/Contractor	Implementing Agency (IA)/Executing Agency (EA)/Environment Specialist (ES)
<b>Loss of agricultural land for borrow pits</b>	- Develop alternative uses for borrow pit areas where is not negative impact on livelihood and protected areas. - Incorporation of replacing damages during project design.	D3	Long term	Engineer	Implementing Agency (IA)/Executing Agency (EA)/Environment Specialist (ES)
<b>2. Recommendation during project construction phase</b>					
<b>Protection of cultural heritage</b>	The subproject is not in Protection of cultural heritage areas, however, when an archaeological <u>site</u> is found, work is to be stopped immediately and the Project Manager notified. Then the Contractor takes the following: - <i>Isolate the location, then call the APSARA Authority to</i>	D2	Medium term	Contractor/ ES/APSARA Authority	Implementing Agency (IA)/Executing Agency (EA)/Environment Specialist (ES)

Issue	Mitigation measures	Significance	Duration	Who responsible?	Monitoring/management
	<p><i>assess the site and determine whether and how it should be preserved;</i></p> <ul style="list-style-type: none"> <li>- <i>Document and photograph the site and area immediately around it;</i></li> <li>- <i>Do not proceed with construction until advised by APSARA Authority.</i></li> </ul> <p><i>When an archaeological artifact is found, work is, again, stopped immediately and the Project Manager and APSARA Authority notified to assess the artifact and determine whether and how it should be excavated and moved. The Contractor should:</i></p> <ul style="list-style-type: none"> <li>- <i>Document and photograph the artifact and the area immediately around it;</i></li> <li>- <i>Do not proceed with construction until advised by APSARA Authority.</i></li> </ul>				
<b>Dust from construction works</b>	<ul style="list-style-type: none"> <li>- Water shall be sprayed during construction if the construction zone will be located close 50 m to urban areas such as village, hospital, school and so on to ensure that dust is minimized throughout the</li> </ul>	D2	Short Term	Contractor	IA/EA/ES <i>Investigator should check and observe at the site during construction and also interview with some villagers, school teacher etc...</i>

Issue	Mitigation measures	Significance	Duration	Who responsible?	Monitoring/management
<b>Dust and material Transportation</b>	<p>construction zone.</p> <ul style="list-style-type: none"> <li>- Dry material handling and transport generate large amounts of dust thus: <ul style="list-style-type: none"> <li>▪ <i>The Contractor shall prepare a dust control program.</i></li> <li>▪ <i>Water shall be sprayed where dry materials are handled, crushed and transported.</i></li> <li>▪ <i>Vehicles transporting materials are to be covered to reduce spills and dust.</i></li> </ul> </li> </ul>	D2	Short Term	Contractor	<i>IA/EA/ES Investigator should check and observe at the site during construction and also interview with villagers living around the area</i>
<b>Air pollution and noise</b>	<ul style="list-style-type: none"> <li>- Vehicle and equipment emissions cause air pollution and noise: Hence, vehicles and equipment are to be maintained to meet Cambodian emission and noise standards..</li> <li>- Construction within 100m of a village or town is to be limited to lunch hours and night time.</li> </ul>	D2	Short term	Contractor	<i>IA/EA/ES</i>

Issue	Mitigation measures	Significance	Duration	Who responsible?	Monitoring/management
<b>Human wastes from construction.</b>	<ul style="list-style-type: none"> <li>- Provision of sanitary facilities (toilets, digging soil etc.) with proper waste disposal, especially a construction area closed to village or resident, will be provided by contractors.</li> </ul>	D2	Short term	Contractor	<i>IA/EA/ES Investigator should observe at a worker camp area during construction and also interview with some villagers in the village etc.</i>
<b>Solid waste generation from construction camp, work sites and workers</b>	<ul style="list-style-type: none"> <li>- Solid waste can create nuisance and bad odor, encourage disease vectors (such as flies and rats), block drainage system and hazard to environment. Hence, 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.</li> <li>- Every camp and work site should be clean during stay and before moving to a new sites.</li> </ul>	D3	Short term	Contractor	<i>IA/EA/ES Investigator should observe at a worker camp area during construction</i>
<b>Traffic and transport of</b>	<ul style="list-style-type: none"> <li>- Construction vehicles will comply with national speed</li> </ul>	D2	Short term	Contractor	<i>IA/EA/ES</i>

Issue	Mitigation measures	Significance	Duration	Who responsible?	Monitoring/management
equipment	limited - Construction vehicles will drive at low speeds, especially at market, school, hospital, urban areas...				
Traffic Jam and accident	- Keep road space or bypass for travelers to avoid traffic congestions. - Vehicle for construction should park at designated safe places. - Construction vehicles will drive at low speeds, especially at market, school, hospital, urban areas...	D2	Short term	Contractor	IA/EA/ES
Soil erosion	- Eroded material/soil from embankments cause deterioration in water quality and impact on some aquatic resources and short life span of the irrigation. Hence good construction practices shall help to mitigate soil erosion and siltation. Additionally re-planting of vegetation will also help to mitigate erosion.	D3	Long term	Contractor	IA/EA/ES

Issue	Mitigation measures	Significance	Duration	Who responsible?	Monitoring/management
<b>Water contamination</b>	<p>- The most severe water quality impact would be from diesel or waste oil of generator and truck. These substances are toxic to living organisms, water quality and soil deterioration. Hence the below mitigation approaches should be followed:</p> <p>(1) 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 an approved site (according to national standard) or to be sold.</p> <p>(2) 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.</p> <p>(3) The Contractor shall prepare a Spill Management Plan (including measures to be taken and equipment</p>	D3	Medium term	Contractor	IA/EA/ES



Issue	Mitigation measures	Significance	Duration	Who responsible?	Monitoring/management
<b>Movement of people and animals</b>	<p>to be used) to ensure adequate cleanup of any spills.</p> <ul style="list-style-type: none"> <li>- Some sections may be a passing way of animals and people. Therefore a temporary bypass or bridge should be provided for ensuring normal passing activities of local people and animals.</li> </ul>	D2	Medium term	Contractor	<i>IA/EA/ES Investigator should observe at the worker camp area during construction and also interview with villagers in the village etc.</i>
<b>Worker safety and health</b>	<ul style="list-style-type: none"> <li>- Workers should wear protection equipment during works to ensure that they are safe and good health.</li> <li>- A contractor should develop a guideline on working mechanism, health and safety during construction. Manager should educate his workers on health and safety projection.</li> </ul>	D3	Short term	Contractor	<i>IA/EA/ES Investigator should check and observe at a construction site during construction.</i>
<b>Transmission of sexually</b>	<ul style="list-style-type: none"> <li>- Provide sanitation and portable water.</li> </ul>	D3	Long term	Contractor	<i>IA/EA/ES</i>

Issue	Mitigation measures	Significance	Duration	Who responsible?	Monitoring/management
<b>communicable diseases</b>	- Education of workers on transmittable diseases.				
<b>Stagnant water areas (breeding mosquito)</b>	Siting camps distant to communities and removal of still water areas.	D2	Long term	Contractor	<i>IA/EA/ES monthly</i>
<b>3. Recommendation during project operation</b>					
<b>Inadequate Operation and Maintenance</b>	- Poor and inadequate operation and maintenance (O&M) of the rehabilitated irrigation systems could cause unintended adverse environmental impacts and long life of the irrigation. Hence the O & M mechanism should be developed for sustainable operation of the irrigation.	D3	Long term	IA/EA	IA/EA/Local Authorities
<b>Water Pollution</b>	- Subprojects will rehabilitate damaged irrigation infrastructure and is not anticipated to increase use of agricultural chemicals beyond pre-flood levels.	D2	Short term	IA/EA/Local Authorities	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 5 year.

## **1. Environmental problem related to project design**

### ***Loss of tree and natural forest (D2)***

29. Although the project will only restore existing irrigations, which were damaged by flooding, there are some possible potential impacts on trees and natural forest including:

- (i) Trees immediately adjacent to the works are affected minimally by the reconstruction.
- (ii) Primary natural forest are selected for borrow pits for sub-base material for irrigation dams.

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 used for fish raising.

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.

### ***Protection of cultural heritage (D2)***

30. The subproject will only restore existing irrigations, thus it will not really affect the cultural and heritage sites and artifacts. However, some alternative approaches need to be considered by project manager or engineer to avoid any possible impact.

Mitigation: Before starting to implement the project, education about archaeological site and artifact for all workers should be done to avoid damaging this archaeological site whenever they found out an archaeological site and artifact in the subproject sites. Thus work has to be stopped immediately and the Project Manager should be notified; then contact to APSARA authority.

Monitoring: Responsibility: Contractor/EA/IA/ES/Engineer

### ***Fish migration (D2)***

31. While rehabilitation of irrigation infrastructure can change post-flood fish movement, the subprojects will not really affect flood fish migration. However, some alternative approaches need to be considered by engineer/designer to avoid any possible impact.

Mitigation: Waterway for fish movement should be considered. A construction should be provided during dry season.

Monitoring: Responsibility: EA/IA/ES/Engineer

### ***Downstream impact (D3)***

32. Most of irrigation is challenging water quantity, especially during dry season. The water remained mostly only during rainy season thus the downstream farmers have not enough water for crop or vegetation.

Mitigation: - Engineer/designer should consider sources of water and storage capacity.  
- IWRM's concept should be applied.

Monitoring: Responsibility: EA/IA/ES/Engineer

### ***Loss of agricultural land (D3)***

33. The project will only improve an existing irrigation thus there is no or only minimal impact on agricultural land through improper disposal of soil or borrow pit.

Mitigation: develop alternative uses for borrow pit areas where is not negative impact on agricultural land.

Monitoring: responsibility: EA/IA/ES/Settlement Specialist/Engineer

### ***Loss of natural trees/protected area for borrow pits***

34. The damaged irrigation dams may be filled by qualitative soil where will be possibly taken in the protected area or flooded forest area for this borrow pit. If as given the above mentioned, some trees and protected area will affect respectively.

Mitigation: develop alternative uses for borrow pit areas where is not negative impact on the protected areas or avoid impact on trees.

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

## **2. Environmental problem related to project construction**

### ***Protection of cultural heritage***

35. Although the project will only restore existing irrigations, it might have archaeological sites on the ground.

Mitigation: When an archaeological site or artifact is found, work is to be stopped immediately and the Project Manager should notify. Then the Contractor should: (i) call the APSARA Authority to assess the site and determine whether and how it should be preserved; (ii) Document and photograph the site and area immediately around it; (iv) Do not proceed with construction until advised by APSARA Authority.

Monitoring: IA/EA/ES Monthly (Monitor should check at the site during construction and also interview with workers, villagers, etc. (especially in Krapeu Main Canal subproject))

### ***Dust Impacts (D2)***

36. Dust from transportation of construction materials to site and irrigation works during construction will be a problem to communities who live closing irrigation construction, 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 work areas and surrounding construction area that may be located close 50 m to villager residents, school, hospital and pagoda.  
- *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)

37. Construction equipment may cause temporary and localized noise and vibration generation. Sources of noise include transportation of material, vehicle and equipment used at the irrigation work site where is close to villager's residents. These will impact on communities where is close to work areas.

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

Monitoring: Contractor/IA/EA/ES, monthly.

## Human wastes from construction (D2)

38. 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, digging soil etc.) with proper waste disposal will be provided by contractors.

Monitoring: Contractor/IA/EA/ES, monthly.

## Solid waste (D3)

39. Solid waste include residue from construction material and worker's eating food and drinking generating plastic bag, white plastic for food package, plastic bottle and glass bottle. Solid waste can create nuisance, encourage disease vectors (such as flies and rats), block drainage system and hazard to human health and environment.

Mitigation: Contractor should ensure that (i) 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 and (ii) every camp and work site should be clean during stay and before moving to a new sites.

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

## Traffic congestion and transport of equipment (D2)

40. The traffic congestion is normally occurred by illegal and disorder parking of equipment.

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

Monitoring: Contractor daily; IA/EA/ES, monthly.

## Traffic accident (D2)

41. Traffic accidents happen accidentally when driver will drive over speed, careless or unprofessional driving.

Mitigation: Contractor should respond: (i) *Construction vehicles will comply with national speed limited;* (iii) *Construction vehicles will drive at low speeds, especially at market, school, hospital, urban areas.* (iv) *Vehicle for construction should park at designated safe places.*

Monitoring: Contractor daily; IA/EA/ES, monthly.

## **Movement of people and animal (D2)**

42. *Some sections may be a passing way of animals and people. Therefore a temporary bypass or bridge should be provided for ensuring normal passing activities of local people and animals.*

Mitigation: Constructor should: (i) disclose information about the construction date to nearby community. (ii) provide a temporary bypass or bridge during construction.

Monitoring: contractor daily/IA/EA/ES, monthly

## **Worker's safety and Health (D2)**

43. Accidents inevitably happen and when they do work. 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)**

44. The potential for soil erosion occur normally during clearing, embankments and earthworks on excavated areas and new cover soil. These will have the ability to provide additional sediment to the water body by rainfall and runoff and will be also damage adjacent land and cause deterioration in water quality, especially life span of irrigation.

Mitigation: The contractor will be required to implement soil and erosion controls to minimize soil erosion and sedimentation of waterways and runoff. The alternative approaches should be: (1) good construction practices shall help to mitigate soil erosion and siltation and (2) re-vegetation of construction area to reduce runoff and flow.

Monitoring: Constructor daily/IA/EA/ES monthly.

## **Water contamination (D2)**

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

Mitigation: Contractor has to ensure that: (i) *Diesel and waste oil are to be handled and stored carefully 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.*

Monitoring: Contractor daily; IA/EA/ES monthly.

## **Loss of trees (D2)**

46. The project will only improve the existing irrigation where damaged during flooding. Thus only some trees will be affected minimally.

Mitigation: *Trees clearing should be avoided as much as possible and trees planting carried out where appropriate in order to enhance the environments around*

*the irrigation.*  
**Monitoring:** IA/EA/ES monthly.

### **Transmission of sexually communicable diseases (D3)**

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

**Mitigation:** Preparation of Health Plan and Education of workers on transmittable diseases.  
**Monitoring:** IA/EA/ES monthly.

### **Stagnant water areas (breeding mosquito victors) (D2)**

48.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 malaria mosquito larvae to develop in.

**Mitigation:** Contractor must ensure that (i) solid waste disposed into safe landfill. (ii) Siting camps distant to community's removal of still water areas, and (iii) borrow pits may improve to be pond for fish raising or storage water for community utilization.  
**Monitoring:** Contractor daily; IA/EA/ES monthly.

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

### **Inadequate Operation and Maintenance (D3)**

49.Poor and inadequate operation and maintenance (O&M) of the rehabilitated irrigation systems could cause unintended adverse environmental impacts and long life of the irrigation. Hence the O & M mechanism should be developed for sustainable operation of the irrigation.

**Mitigation:** The IA/EA/Consultant should develop an acceptable operation and maintenance of the irrigation system. The developed operation and maintenance must implement fairly. Responsibility for implementation: local authority/irrigation community/IA/EA  
**Monitoring:** IA/EA monthly for 1 year after irrigation completion for construction.

### **Water Pollution (D2)**

50.Subprojects will rehabilitate damaged irrigation infrastructure and is not anticipated to increase use of agricultural chemicals beyond pre-flood levels.

**Mitigation:** Public awareness on effect of pesticide and chemical use.  
**Monitoring:** Local authority daily.

## **4. Potential positive environmental and social impacts**

### ***During project construction:***

51.**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:***

**52.Easier access water for agriculture (+D3):**The improvement of the irrigation system will reduce risk of dry land which will benefit to farmers at the irrigation areas where can access water from the rehabilitated irrigation.

**53.Livelihood/Income (+D3):** The improvement of the irrigations will increase different kind of agricultural activities such as crop, vegetation, rice and livestock raising etc. These activities will provide job for local people and will reduce immigration for jobs.

**54.Improved public access (+D3):** The improved irrigation will provide benefit to improving road access/irrigation dam to rice field, especially local communities.

Monitoring: no need

**E. Institutional Requirements and Monitoring Program**

**a. Institutional Arrangement**

55.MEF is the executing agency (EA) 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 IA properly follows the IEE and review framework (EARF) during subproject implementation. Each PIU has a Safeguards Focal Persons, and they in turn will be supported by an Environment Specialist within the IA's consultant team. 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 data required for safeguards plan preparation and monitoring and progress reports, and coordination with relevant departments such as department of environment to consult and/or obtain endorsement if necessary.

**b. Monitoring program**

56.The PIUs 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. **Appendix 1** provides a content outline for monitoring reports. In addition to recording information of the work, deviation of work components from original scope, the PIUs will undertake site inspections and document review to verify compliance with the EMP and progress toward the final outcome.

57.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.

58.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.

59.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.

## **F. Information disclosure, consultation and participation**

60.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 Environmental Assessment Review Framework (EARF) during subproject implementation. 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.

61.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.

62.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.

## **G. Grievance Redress Mechanism**

63.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)

64. 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. MOWRAM), 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.

65. 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, village 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.

66. 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.

67. 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.

68. 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 checks by the Local Environmental Specialist and regular oversight checks by International Environmental Specialist.
- Checks with complainants that they are satisfied

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.

## **H. Conclusion and Recommendation**

69. 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 overall benefits to communities of livelihood.

70. During construction a series of temporary negative impacts including dust, noisy, road safety, worker's safety, wastewater, solid waste and water contamination will be occurred, however, those impacts are be avoidable and reduced by environmental control measures

and mitigation measures. As for operational stage, the benefit of the project results will mostly be expected respectively. The benefit includes improving community livelihood, public health, tourist and amenity.

71. In order to reduce the impacts, the alternative approaches are recommended as below:

1. The environmental mitigation measures and environmental monitoring plan which present in the IEE report should be implemented.
2. Good cooperation between all stakeholders, especially IA, EA and local authorities should be undertaken.
3. Consultation with the local community should be implemented that it can update concerns and issues during project construction and operation.
4. Further investigations are needed with regard to developing a suitable design for the excavation and borrow pit (if require) so that these may provide a range of multiple uses for the farmers whose land they will be excavated on.

72. 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.

**References:**

- EARF, 2012: Cambodia: Food Damage Emergency Reconstruction Project; Environmental Assessment and Review Framework.
- GMS, 2002: Initial Environmental Examination; GMS Road Improvement Project (2002).
- <http://en.wikipedia.org/wiki/Cambodia>.
- JICA data set (2002).
- NREM, 2007: NREM Data Tool Box – Royal Danish Embassy- Danida - Phnom Penh, Cambodia, March 2007.
- Population Census, 2008: General Population Census 2008; National Report on Final Census Results; National Institute of Statistics, Ministry of Planning.
- Royal decree on the creation and designation of protected areas (1993).
- World Bank (2003): Cambodia Environment Monitor 2003.

## **APPENDIX 1: 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.