

# Initial Environmental Examination

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July 2015

## Cambodia: Greater Mekong Subregion Livelihood Support for Corridor Towns

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Japan  
Fund for  
Poverty  
Reduction



## FINAL Initial Environmental Examination

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### Battambang Night Market

ADB-Grant 9173 REG: GMS Livelihood Support for Corridor Towns

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July 2015

## Executive Summary

The “Greater Mekong Subregion Livelihood Support for Corridor Towns Project” aims to pilot market development as an approach to poverty reduction in the Greater Mekong Subregion (GMS) by providing market facilities for informal poor vendors in the Battambang town of Battambang Province, Cambodia that will: (i) address the lack of security and hygiene; (ii) enhance the health conditions of traders and other users; (iii) address access to customer flow translating to increased income with a facility that is attractive to customers; and (iv) promote quality products as a result of created and/or enhanced product value chains. Such market development will primarily benefit market vendors currently working as informal traders, and target the self-employed urban poor population in the Province, supporting, among others, the sale of locally-produced products.

This report gives an account of the Initial Environmental Examination (IEE) of the proposed project. The IEE was conducted as part of the project preparation to primarily: (i) identify and assess potential impacts arising from project implementation on the physical, ecological, socioeconomic, and physical cultural environment and resources; and (ii) recommend measures to avoid and mitigate adverse impacts.

In compliance with ADB’s Safeguard Policy Statement (SPS), 2009 of the guidelines for conducting IEEs, the study focuses on physical, ecological, and sociocultural resources, using mainly primary data. Both secondary and primary data was collected. The secondary data collection (laws, regulations, and policy) is based on a desk study in Phnom Penh. Site visits were also conducted. As part of the primary data collection, stakeholder meetings were held with the Provincial Department of Environment, Provincial Department of Tourism (PDoT), Provincial Department of Planning (PDoP), Provincial Department of Land Management, Urban Planning, and Construction, and the Battambang Municipality. Discussions were also conducted with Svay Pao Sangkat, where the Project is located.

The Project is the construction of Battambang Night Market which is located at Svay Pao Sangkat in Battambang Municipality. An area of approximately 7,000 m<sup>2</sup> of vacant land at the town square in between the Battambang provincial office and the Sangke River has been identified for project development.

The proposed night market development is unlikely to cause significant adverse impacts; it is not environmentally critical and not within, or adjacent to environmentally-sensitive areas, and is regarded as Category B of ADB’s guidelines. An IEE is therefore sufficient.

The few adverse direct impacts during construction are expected to be local and will be temporary and short-term. The impacts can be mitigated to acceptable levels without difficulty through proper engineering design and the incorporation of recommended mitigation measures. They will not be sufficient to threaten or weaken surrounding resources and will not be critically harmful to environmental health.

The full implementation of the environmental management plan (EMP) by the contractor will involve putting adequate mitigation measures in place to address project impacts.

The proposed project will improve municipality infrastructure. The resulting diversity of locally-produced products is expected to be rapidly more marketable. Economic activities will then be more active and significantly contribute to a qualitative improvement in the lives of street and other related vendors in the Municipality.

Overall, the Project will significantly improve the Municipality and contribute to economic and social development.

Therefore, the Project should proceed to the ***detailed design stage***.

# Contents

<b>Chapter 1 - Introduction .....</b>	<b>1</b>
1. Project Background .....	1
2. Purpose of the IEE.....	1
3. Methodology .....	1
3.1. Secondary Data Collection .....	2
3.2. Primary Data Collection .....	2
3.3. Field Visit to the Project Location.....	2
4. Outline of the Report.....	2
<b>Chapter 2 - Policy, Legal, and Administrative Frameworks .....</b>	<b>3</b>
1. ADB Safeguard Policy.....	3
2. Cambodia's Policy Framework.....	3
3. Cambodia's Legal Framework.....	3
3.1. Law on Environment .....	3
3.2. Law on Nature Reserves.....	4
3.3. Law on Historical Monuments .....	4
3.4. Land Law.....	4
3.5. Expropriation Law .....	4
3.6. Subsidiary Laws on Environmental Protection.....	4
3.6.1. Sub-decrees and Regulations .....	4
3.6.2. Sub-Decree on Water Pollution Control (No. 27 ANRK.BK 1999) .....	4
3.6.3. Sub-Decree on Solid Waste Management (No. 36 ANRK.BK 1999) .....	5
3.6.4. Sub-Decree on Air and Noise Pollution Control (No. 42 ANRK.BK 2000) .....	5
3.6.5. Hazardous Substances .....	5
3.7. International Environmental Agreements.....	6
4. Cambodia's Administrative Framework.....	6
4.1. Cambodian IEE Requirements .....	6
5. Cambodia's Requirements and ADB's Requirements .....	6
<b>Chapter 3 - Description of the Project.....</b>	<b>8</b>
1. Project Type.....	8
2. Environmental Category of the Project.....	8
3. Need for the Project .....	8
4. Size and Magnitude .....	8
5. Geographic Location.....	9
6. Project Implementation Schedule .....	11
<b>Chapter 4 - Description of the Environment.....</b>	<b>12</b>
1. Physical/Chemical Environment .....	12
1.1. Topography, Geology, and Soils .....	12
1.1.1. Natural Hazards .....	14
1.2. Climate .....	15
1.2.1. Climate Change.....	15
1.3. Air Quality.....	16
1.4. Surface Water .....	16
2. Ecological Environment.....	17
2.1. Flora .....	17
2.2. Fauna .....	17
2.3. Protected Areas .....	17

<b>3. Economic Development</b>	<b>18</b>
3.1. Economy	18
3.2. Land Use and Urban Development	18
3.3. Infrastructure Facilities	19
3.3.1. Roads and Transport	19
3.3.2. Water Supply and Sanitation	20
3.3.3. Drainage	20
3.3.4. Solid Waste Management	21
3.3.5. Electricity	21
3.4. Tourism	21
<b>4. Social and Cultural Resources</b>	<b>22</b>
4.1. Population and Communities	22
4.2. Ethnic Minorities	22
4.3. Employment and Income	22
4.4. Poverty	23
4.5. Education	23
4.6. Healthcare	24
4.7. Archaeological/Cultural Sites	24
<b>Chapter 5 - Anticipated Environmental Impacts and Mitigation Measures</b>	<b>25</b>
1. Positive Environmental Impacts and Benefits	25
2. Screening of Potential Impacts	25
3. Impacts and Mitigation Measures Related to Siting and Design	25
4. Impacts and Mitigation Measures during Construction	25
4.1. Impacts on Air Quality	25
4.2. Impacts on Water Resources	26
4.3. Impacts on Soil	26
4.4. Impacts on the Landscape	26
4.5. Impacts on the Ecological Environment	26
4.6. Impacts on the Socioeconomic Environment	26
4.7. Mitigation Measures	26
5. Impacts and Mitigation Measures during Operations	27
5.1. Solid Waste Management	27
5.2. Noise Levels	27
5.3. Mitigation Measures	27
6. Indirect, Cumulative, and Induced Impacts	27
6.1. During Construction	27
6.2. During Operations	27
7. Unanticipated Impacts during Construction and Operation	27
<b>Chapter 6 - Public Consultation and Information Disclosure</b>	<b>29</b>
1. Identification of Stakeholders	29
2. Summary of Public Consultation and Project Response	29
3. Information Disclosure	30
<b>Chapter 7 - Grievance Redressal Mechanism</b>	<b>31</b>
1. Purpose of the Mechanism	31
2. Proposed Setup	31
3. Access to the Mechanism	31
4. GRM Steps and Timeframe	31
4.1. Informal Approach	31
4.2. Formal Approach	32

<b>Chapter 8 - Environmental Management Plan .....</b>	<b>34</b>
1. Mitigation and Monitoring Plans .....	34
2. Reporting Plan.....	34
3. Implementation Arrangements .....	34
3.1. Implementation Schedule .....	34
3.2. Institutional Responsibilities .....	34
4. Preliminary Costs .....	36
<b>Chapter 9 - Conclusion and Recommendations .....</b>	<b>37</b>

**Annex A – Analysis Reports: Air Quality and Water Quality**

**Annex B – List of Fauna found by Local People**

**Annex C – Cambodia’s Protected Areas**

**Annex D – Public Consultation Participation**

**Annex E – Photo Pages for the Project**

**Annex F – Screening for Environmental Impacts**

**Annex G – Environmental Mitigation Plan**

**Annex H – Environmental Monitoring Plan**

## List of Figures

Figure 1a: Map of project location.....	9
Figure 1b: Specific location of the project in Battambang Municipality.....	10
Figure 2: Topographical map around the Project area .....	12
Figure 3: Generalized view of the geology of Cambodia .....	13
Figure 4: Generalized distribution of soil fertility in Cambodia.....	13
Figure 5: Average monthly and annual rainfall .....	15
Figure 6: Land use map in the urban area of Battambang .....	19

## List of Tables

Table 1: RGC's requirements and ADB's requirements .....	7
Table 2: Project schedule.....	11
Table 3: Natural hazards in Cambodia* .....	14
Table 4: Monthly and annual rainfall of Battambang Province, 2010–2014 .....	15
Table 5: Results of water quality analysis of the Sangke River, March 2015.....	17
Table 6: Roads and sewerage system, 2013.....	19
Table 7: Tourist arrival in Battambang Province, 2014 .....	21
Table 8: Households and population .....	22
Table 9: Families with specific and non-specific occupations.....	22
Table 10: Poor households in the six municipalities around the Tonle Sap Lake .....	23
Table 11: Statistics of public education institutions in the Municipality, as of December 2013 .....	23
Table 12: Education status.....	24
Table 13: Major diseases recorded at Svay Pao Health Center, 2014.....	24
Table 14: Summary of stakeholder views for the Project .....	29
Table 15: Institutional responsibilities .....	35

## Acronyms and Abbreviations

<b>AP</b>	Affected Person
<b>ADB</b>	Asian Development Bank
<b>DPWT</b>	Department of Public Works and Transport (provincial)
<b>EA</b>	Executing Agency
<b>EIA</b>	Environmental Impact Assessment
<b>EMP</b>	Environmental Management Plan
<b>EMR</b>	Environmental Monitoring Report
<b>ESO</b>	Environmental Safeguard Officer
<b>GRM</b>	Grievance Redressal Mechanism
<b>IEE</b>	Initial Environmental Examination
<b>IEIA</b>	Initial Environmental Impact Assessment
<b>MoE</b>	Ministry of Environment
<b>MPWT</b>	Ministry of Public Works and Transport
<b>PDWT</b>	Department of Public Works and Transport
<b>PDoE</b>	Provincial Department of Environment
<b>PDoP</b>	Provincial Department of Planning
<b>PDoT</b>	Provincial Department of Tourism
<b>PIU</b>	Project Implementation Unit
<b>PMU</b>	Project Management Unit
<b>REA</b>	Rapid Environmental Assessment
<b>RGC</b>	Royal Government of Cambodia
<b>SPS</b>	Safeguard Policy Statement
<b>WWTP</b>	Wastewater Treatment Plant



# Chapter 1 - Introduction

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## 1. Project Background

The Greater Mekong Subregion Livelihood Support for Corridor Towns Project (the Project) aims to pilot market development as an approach to poverty reduction in the Greater Mekong Subregion (GMS) by providing market facilities for informal poor vendors in the Battambang Municipality of Battambang Province, Cambodia that will: (i) address the lack of security and hygiene; (ii) enhance the health conditions of traders and other users; (iii) address access to customer flow translating into increased income with a facility that is attractive to customers; and (iv) promote quality products as a result of created and/or enhanced product value chains. Such market development will primarily benefit market vendors currently working as informal traders and target the self-employed urban poor population in the Province, supporting among others, the sale of locally-produced products.

Through Asian Development Bank (ADB) financial support, the Royal Government of Cambodia (RGC) commits to developing the project to be designed to collect information from a number of street and other related vendors in the Municipality and get them organized in the project area to be known as an environmentally-acceptable and marketable place.

The Project has four components: Component A - Construction of Battambang Night Market; Component B - Microfinance support for market vendors; Component C - Training and awareness campaigns; and Component D - Project management. A feasibility study will be conducted within Component A. This will require an Initial Environmental Examination (IEE).

This IEE report presents the screening of potential environmental impacts of the proposed project and contains mitigation measures to eliminate and/or reduce the negative impacts to an acceptable level. It describes institutional responsibilities and provides an environmental management plan (EMP).

## 2. Purpose of the IEE

This report gives an account of the IEE of the proposed Project. The IEE was conducted as part of the project preparation to primarily: (i) identify and assess potential impacts arising from project implementation on the physical, ecological, socioeconomic, and physical cultural environment and resources; and (ii) recommend measures to avoid and mitigate adverse impacts. The IEE was carried out following the Safeguard Policy Statement (SPS), 2009 of the ADB, with reference to the "Law on Environmental Protection and Natural Resource Management", 1996, the sub-decree on EIA Processes, 1999, and the Declaration on General Guidelines for Initial Environmental Impact Assessment (IEIA) and Environmental Impact Assessment (EIA) Reports, 2009 of the Government of Cambodia. Relevant reports, site visits, and consultations with relevant stakeholders have provided bases to this IEE.

## 3. Methodology

In compliance with the ADB's SPS, 2009 of the guidelines for conducting IEEs, the study focuses on physical, ecological, and sociocultural resources using mainly primary data. The main aims of the data collection process are to produce precise results in terms of determining both environmentally positive and negative impacts in the project area. Secondary data was also collected as a supplement to the study. The collected data must finally be in a useful, appropriate, and acceptable form in terms of EIA.

#### Secondary Data Collection

The secondary data collection—laws, regulations, and policy—is based on a desk study in Phnom Penh. This involved a thorough review and analysis of literature for the acquisition of the data. A sangkat-level profile and other related information was collected. Primary data collection started once secondary data collection was complete.

#### Primary Data Collection

Stakeholder meetings were held with government institutions such as the Battambang Municipality, the Provincial Department of Public Works and Transport (DPWT), Provincial Department of Environment (PDoE), Provincial Department of Planning (PDoP), and the Department of Tourism. Consultations were also conducted with the Svay Pao Sangkat councils where the Project is located. The purpose of these meetings and consultations was to learn about general perceptions regarding the proposed project.

#### Field Visit to the Project Location

Field visits were conducted as part of the data collection process to learn about the actual condition of the project area. Through the visits, project scoping, activities categorization, project stakeholders, and assessment of potential impacts were identified. A rapid environmental assessment (REA) checklist was also completed.

## 4. Outline of the Report

The report consists of nine chapters. Chapter 1 describes the project background, purposes, methodology, and outline of the report. Relevant laws and regulations are provided in Chapter 2. A general project description is given in Chapter 3. A description of the environment is given in Chapter 4. Chapter 5 covers anticipated environmental impacts and mitigation measures. Public consultation and participation is described in Chapter 6. Grievance redressal mechanisms (GRMs) and environmental management plans are described in Chapter 7 and 8, respectively. The final chapter, Chapter 9, outlines conclusions and recommendations.

# Chapter 2 - Policy, Legal, and Administrative Frameworks

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## 1. ADB Safeguard Policy

The ADB's SPS 2009 clarifies the rationale, scope, and content of an environmental assessment and is supported by technical guidelines (e.g., the Environmental Assessment Guidelines, 2003). Projects are initially screened to determine the level of assessment that is required according to three environmental categories. Category A is for projects that normally cause significant environmental impacts that are irreversible, diverse, or unprecedented, such as hydroelectric dams (an EIA is required). Category B projects have potential adverse impacts that are less adverse than those of Category A, are site-specific, largely reversible, and mitigation measures can be designed more readily than for Category A projects (an IEE is required). Category C projects are likely to have minimal or no negative environmental impacts. An environmental assessment for Category C projects is not required, but environmental implications need to be reviewed.

## 2. Cambodia's Policy Framework

In 1993, the RGC confirmed a new Constitution in which environmental considerations were included for the first time. Specifically, Article 59 states that *"The State shall protect the environment and balance of abundant natural resources and establish a precise plan of management of land, water, air, wind, geology, ecological systems, 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.

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; and
- Regulation issued by a ministry.

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 ensure their operations comply with the regulations.

## 3. Cambodia's Legal Framework

### Law on Environment

In 1996, the "Law on Environmental Protection and Natural Resource Management" (NS/RKM/-1296/36) came into force and 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.

Other ministries explicitly mentioned at the time were the 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 (MPWT), Ministry of Agriculture, Forestry and Fisheries, Ministry of Rural Development, Ministry of Health, and the

Ministry of Tourism.

Article 6 of the “Law on Environmental Protection and Natural Resource Management” states that an EIA shall be conducted for every project and activity, private or public, and shall be reviewed and evaluated by the MoE or its provincial departments before being submitted to the RGC for approval. General provisions for each EIA, the institutional responsibilities, and requirements for EIA procedures and conditions for approvals are covered in that sub-decree. A two-stage process is specified for environmental assessment, similar to that required by the ADB, whereby an IEIA is prepared for most projects. The required scope and format of the IEIA resembles that of the IEE required under ADB requirements (The ADB’s SPS, 2009).

#### Law on Nature Reserves

Royal Decree, “Protected Natural Areas” issued in November 1993 gives protection to the 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 the MoE.

#### Law on Historical Monuments

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 and ancient structures.

#### Land Law

The “Land Law” was passed by the National Assembly on July 20, 2001. The relevant articles are stated. One of the main articles, Article 5, states that “No person may be deprived of his ownership, unless it is in the public interest”. An ownership deprivation shall be carried out in accordance with the forms and procedures provided by law and regulations and after the payment of fair and just compensation in advance.

#### Expropriation Law

The Law was passed by the National Assembly on February 26, 2010. The relevant articles are stated. One of the main articles, Article 3, is applied to expropriations involving public physical infrastructure projects in Cambodia. This law does not govern any issues on expropriation in any agreement or memorandum on supporting investments between the RGC and partner countries. In case there is no such agreement, or in case the agreement or the memorandum does not deal with expropriation, any expropriation shall be governed by this law.

#### Subsidiary Laws on Environmental Protection

##### Sub-decrees and Regulations

The “Law on Environmental Protection and Natural Resource Management”, 1996 is “enabling legislation”, in that it enables the MoE 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 operations.

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.

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

As a minimum, all discharges of liquid wastes from construction camps, work sites, or operations to streams or water courses should adhere to the following regulations: biochemical oxygen demand (BOD)  $\leq 50$  mg/L; turbidity  $< 5$  nephelometric turbidity units (NTU); SS  $\leq 50$  mg/L; temperature  $< 45^{\circ}\text{C}$ ; pH = 6–9; oil and grease  $\leq 5$  mg/L and dissolved oxygen (DO)  $> 4$  mg/L.

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

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

Article 7 of the sub-decree on Solid Waste Management (No. 36 ANRK.BK 1999) states that “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.

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

#### Sub-Decree on Air and Noise Pollution Control (No. 42 ANRK.BK 2000)

##### **i. Air Quality**

The air pollution regulations are contained in a 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 total suspended particles (TSP)  $< 0.33 \text{ mg/m}^3$  per 24-hour average should be met. All vehicles should be well maintained and comply with air quality regulations.

##### **ii. Noise**

The noise regulations are contained in a 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. They do not specify a measurement method, either. Therefore, the following standards are recommended. Noise levels at the perimeter of any site should not exceed:

- Continuous Equivalent Level (Leq) = 75 dB(A) per 12-hour period - daytime (07.00–19.00)
- Continuous Equivalent Level (Leq) = 65 dB(A) per 12-hour period - nighttime (19.00–07.00)

The descriptor “Continuous Equivalent Level” (Leq) is a common 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 gaining access to a private residence. The aforementioned Leq figures are a “good” standard and commonly used in some Association of Southeast Asian Nations (ASEAN) such as Singapore and Malaysia.

##### **iii. Vibration**

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 1 mm/second peak particle velocity (ppv). The level of 1 mm/second ppv is a good “standard” and is derived from US Bureau of Mines publications for avoidance of damage and the UK Greater London Council (GLC) standard for avoidance of nuisance.

#### Hazardous Substances

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.

#### International Environmental Agreements

Cambodia is party to the following international environmental agreements relevant to the Project: (i) the UNESCO World Heritage Convention, 1991; (ii) Convention on Biodiversity, 1995; (iii) UN Framework Convention on Climate Change, 1995; (iv) Washington Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1997; (v) Ramsar Convention on Wetlands of International Importance, especially as Waterfowl Habitat, 1999; (vi) Basel Convention on the Control of Transboundary Movements of the Hazardous Wastes and Their Disposal, 2001; (vii) Vienna Convention for the Protection of the Ozone Layer and its Montreal Protocol on Substances that Deplete the Ozone Layer, 2001, and all Amendments, 2007; (viii) Climate Change Kyoto Protocol, 2002; and (ix) the International Tropical Timber Agreement, 2006.

Cambodia joined the UNESCO Network of Biosphere Reserves in 1997. It is committed to the Millennium Development Goals (MDGs), the seventh goal of which is to “ensure environmental sustainability”. It is among the 168 governments that adopted the Hyogo Framework for Action 2005–2015, a ten-year global footprint for disaster risk reduction efforts, in January 2005. At the regional level, it ratified two ASEAN agreements, namely the “Transboundary Haze Pollution” in 2006 and the “Disaster Management and Emergency Response” (AADMER), which entered into force in 2009. At the sub-regional level, Cambodia, along with Lao PDR, Thailand, and Vietnam, signed the “Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin” (or the Mekong Agreement) in April 1995.

## 4. Cambodia’s Administrative Framework

#### Cambodian IEE Requirements

On August 11, 1999 a sub-decree (72 ANRK.BK) on EIA Processes was promulgated requiring an IEIA or EIA for selected projects listed in the sub-decree annex “List of the projects that require an IEIA” to be submitted by public or private project owners to the MoE for review. This means that under the sub-decree, the MoE is responsible for reviewing IEIAs and EIAs and collaborating with the line ministries. The MoE has the authority to approve or reject a project. The Council for the Development of Cambodia has overall jurisdiction over projects and also has the power to comment and require amendments or additions in IEIAs and EIAs. The MoE has further responsibility in the monitoring of project implementation. It implements these responsibilities through its Department of Environmental Impact Assessment. Besides the MoE, other ministries with responsibility for projects have the right to examine and approve projects, following MoE review.

The primary responsibility for undertaking environmental assessments of projects lies with the project owner. The assessment work is carried out by the project owner or consultants retained for the purpose.

The specified IEIA/EIA process consists of the identification of environmental impacts, review and examination of alternatives to the proposed project, and the communication of information to stakeholders. In the case of both IEIAs and EIAs, the MoE is required to respond, providing findings and recommendations to the project owner, within 30 working days of document submission.

Article 1 of the sub-decree on EIA Processes states that public participation is to be encouraged in the implementation of the IEIA process so that the conceptual inputs and suggestions of the public are taken into account for consideration prior to project implementation.

## 5. Cambodia’s Requirements and ADB’s Requirements

In general, the requirements for IEEs or EIAs for project development are in accordance with the RGC’s sub-decree on EIA processes and ADB’s SPS. Table 1 summarizes the requirements for

both.

Table 1: RGC's requirements and ADB's requirements

<b>RGC's sub-decree on EIA processes</b>	<b>ADB's SPS</b>
Article 20 of the sub-decree on EIA, August 11, 1999, states "Before implementing the proposed project, the project's owner should receive consent from the MoE in advance on the report of IEIA or full EIA".	The requirements apply to all ADB-financed and/or ADB-administered sovereign and non-sovereign projects, and their components regardless of the source of financing, including investment projects funded by a loan; and/or a grant; and/or other means, such as equity and/or guarantees (hereafter broadly referred to as projects).
During pre-feasibility or feasibility study for the proposed projects.	At an early stage of project preparation, it mean before loan agreement signing.

## Chapter 3 - Description of the Project

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### 1. Project Type

The project type is urbanization development that falls within the infrastructure sector of the sub-decree on EIA processes of the MoE. An IEE is therefore required. It is also classified into urban development within ADB's Environmental Assessment Guideline, 2003. The Project is designed to gather street and other related vendors and organize them in an environmentally acceptable and marketable place.

### 2. Environmental Category of the Project

An REA checklist was prepared according to the ADB's SPS, 2009 (Annex-F). Based on the initial findings, it was ascertained that only insignificant adverse environmental impacts are expected due to development of the proposed night market. The project is therefore considered to be Category B. The ADB EIA Guidelines, 2003 stated that a proposed project is classified as Category B if its potential adverse environmental impacts are less adverse than those of Category A projects. These impacts are site-specific, few, if any, are irreversible, and in most cases, mitigation measures can be designed more readily than for Category A projects. Therefore, An IEE is required.

### 3. Need for the Project

Over the 15 years to 2007, the overall national poverty ratio declined to about 36%, which is still high when compared to neighbouring nations (Vietnam's fell to 20% and Thailand's 12%). The poverty distribution varies considerably in Cambodia, from less than 15% in the capital city to over 45% in the northern and northeastern provinces and in the vicinity of the Tonle Sap. In view of this, the RGC, with assistance from the ADB and development partners, has been addressing the urban poor's problems through comprehensive urban development measures for provincial and subregions centers. The RGC's approach targets both the urban poor in towns and the poor in the urban hinterlands. ADB's recent studies found that the poor require targeted livelihood development assistance to allow them to more effectively exploit economic opportunities associated with improved connectivity. Integrating micro and small vendors' activities into larger urban infrastructure programs is an innovative approach to address the urban poor's livelihood development needs and accelerate pro-poor inclusive economic growth<sup>1</sup>.

The project construction is, therefore, the most important need for not only the street and related vendors in upgrading their living standards, but also for improving economic activities in the Municipality.

### 4. Size and Magnitude

Project size and magnitude are still under study. However, key elements to scope design and the function of markets are as follows:

- 1) The external and interior design of the night market will include traditional architectural motifs that reflect cultural and social settings. This is particularly important for the domestic, regional, and international tourist trade. The tourist trade is a growing and lucrative source of income for the Municipality and tourists are attracted by authentic locally-produced handicrafts and

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<sup>1</sup> A 2012 MoU between the RGC and the ADB.



- processed and cooked foods. Comfortable spaces for serving food, toilet and bathroom facilities, and clear directional signage are important additions to a well-designed tourist market;
- 2) The location of the market will also be determined by vehicle access and parking—including enough space for tourist buses and vehicles delivering supplies to vendors. Another consideration will be the market location with respect to the ease of access to main power, water supply, and wastewater discharge to municipal sewage treatment facilities, where available;
  - 3) Pedestrian access and movement around the market is an important consideration that will determine orientation, layout, and pedestrian flow through the market. A clear separation of pedestrian paths and walkways from vehicles will be prioritized—especially managing the access of smaller motorcycles, which commonly infringe upon pedestrian spaces inside the market. Ideally, the design of the market will dictate that the delivery of stock and other supplies to market vendor stalls will be handled from the rear of the stalls. This simple separation will provide pedestrians with easy access and movement from one stall to another, and by designing wide pathways and open spaces with seating, allow shoppers to rest, occasionally. These open spaces will be enhanced by the inclusion of trees, shrubs, and flowerbeds where there is sufficient light and space;
  - 4) The dimensions of the market will be determined largely by intelligent design, as well as the budgets allocated for market construction. The market design will also influence the number of vendor stalls and vendor spaces—and with an estimated 200 market vendors taking up the opportunity to set up their market stalls—which will be a challenge. Of concern to market vendors will be location, security, access to utilities, adequate space, and affordable rents. These issues will need to be taken into account during the market design phase. The stalls will be constructed using traditional Khmer features. An existing building (old library) will be re-used to accommodate the office and other market facilities. The facilities that will be accommodated in the existing building will be determined during the preparation of the detailed engineering design for the market.

## 5. Geographic Location

The Project is located in Svay Pao Sangkat of Battambang Municipality, which is in front of Battambang Waterworks. It can be reached from Phnom Penh by travelling northwest by National Road No. 5 for about 291 km (see Figures 1a and 1b).

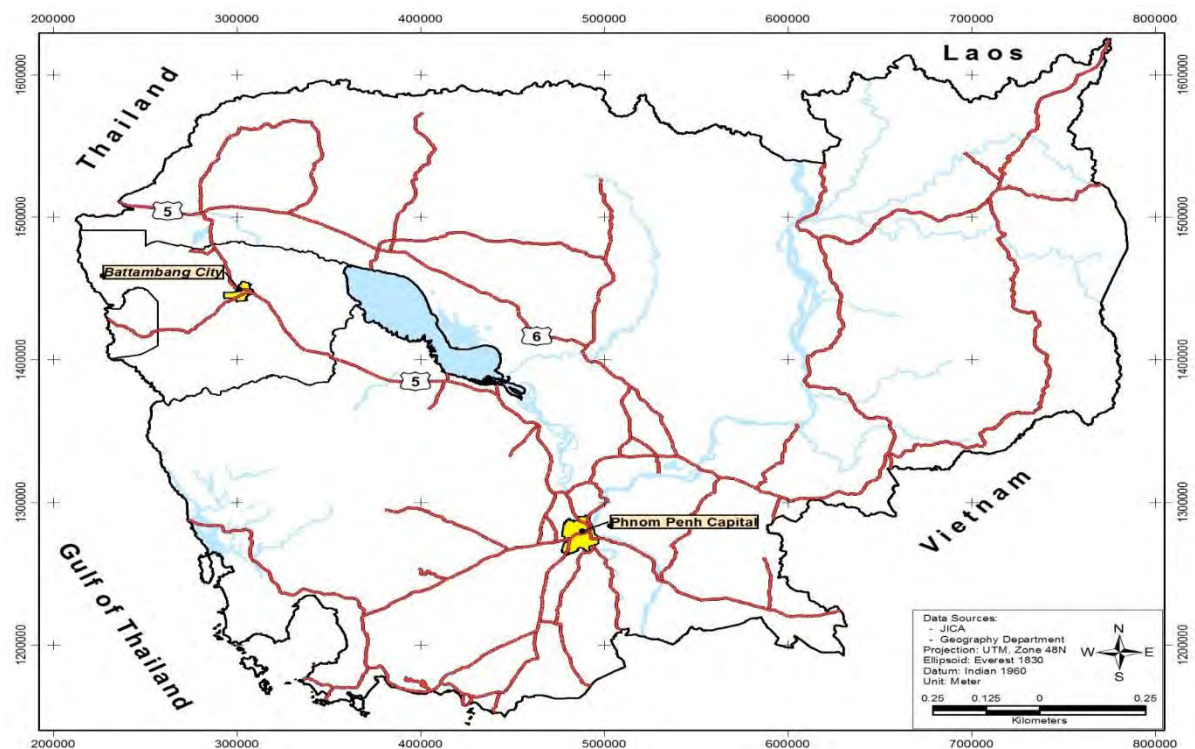


Figure 1a: Map of project location





Figure 2b: Specific location of the project in Battambang Municipality

## 6. Project Implementation Schedule

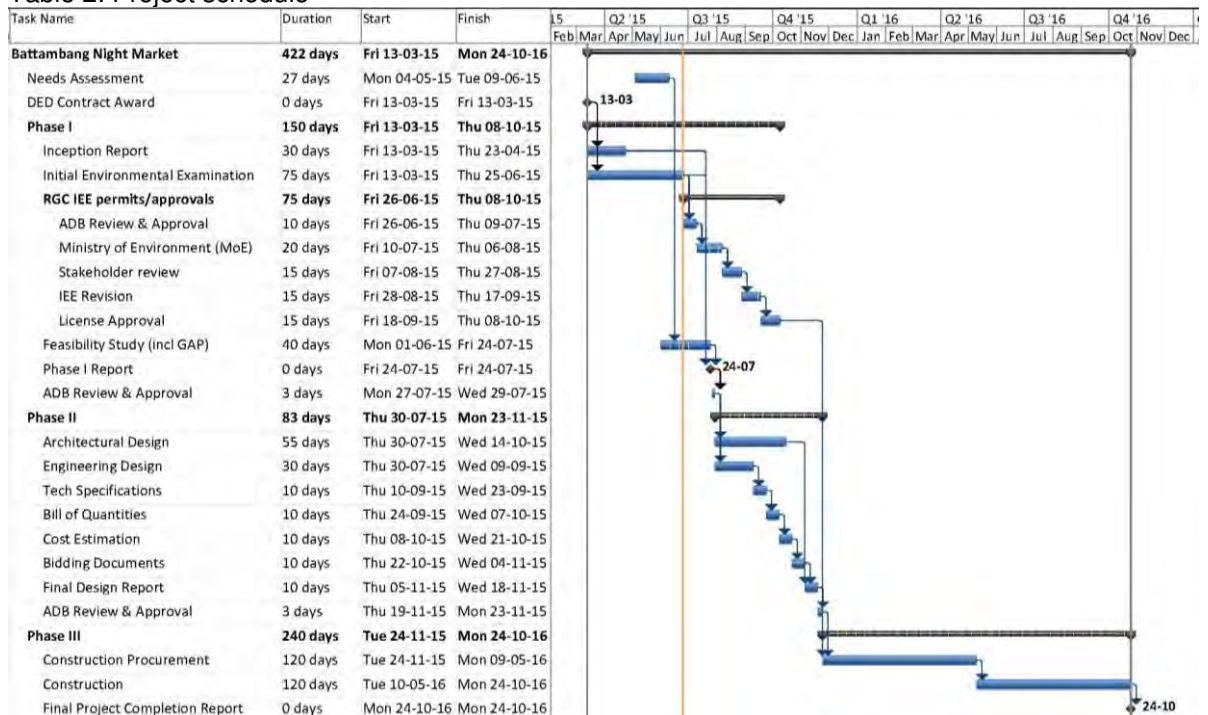
The Project is planned to be executed in the following timeframe:

1. Phase 1: Preparation of FS and IEE – three months;
2. Phase 2: Preparation of DED and tender documents – three months;
3. Phase 3: Construction supervision – six months.

It is notable that the schedule is subject to change upon availability of all project documents and data needed to implement planned activities in each phase. The detailed schedule is shown in Table 2.

Based on the current schedule, there are no issues in terms of synchronization of RGC requirements with ADB requirements for the IEE permitting and approvals.

Table 2: Project schedule



Note: 1. Indicate all main activities of the assignment, including delivery of reports (e.g., inception, interim, and final reports) and other benchmarks, such as ADB approvals. For phased assignments, indicate activities, delivery of reports, and benchmarks separately for each phase.  
2. The duration of activities must be indicated in the form of a bar chart.



# Chapter 4 - Description of the Environment

## 1. Physical/Chemical Environment

### Topography, Geology, and Soils

The topographical conditions are generally flat with a maximum elevation of 10–20 m above mean sea level in and around the Project area (Figure 2). A major feature of Battambang is the Sangke River which flows through the Municipality centre and varies in extent as the level rises significantly with varying seasonal precipitation.

The geology of the Municipality, Battambang Province, and Cambodia in general, is a complex subject and poorly known<sup>2</sup>. As shown in Figure 3, the soil type in the Municipality is alluvium that tends to retain water much better than rocky or sandy soils. Generally, the Province is well known as a main agricultural products producer, since it is located in a highly fertile region on the Tonle Sap Lake (Figure 4). A combination of good rainfall, annual flooding, and investment in irrigation systems ensures that soils support a very strong agricultural sector.

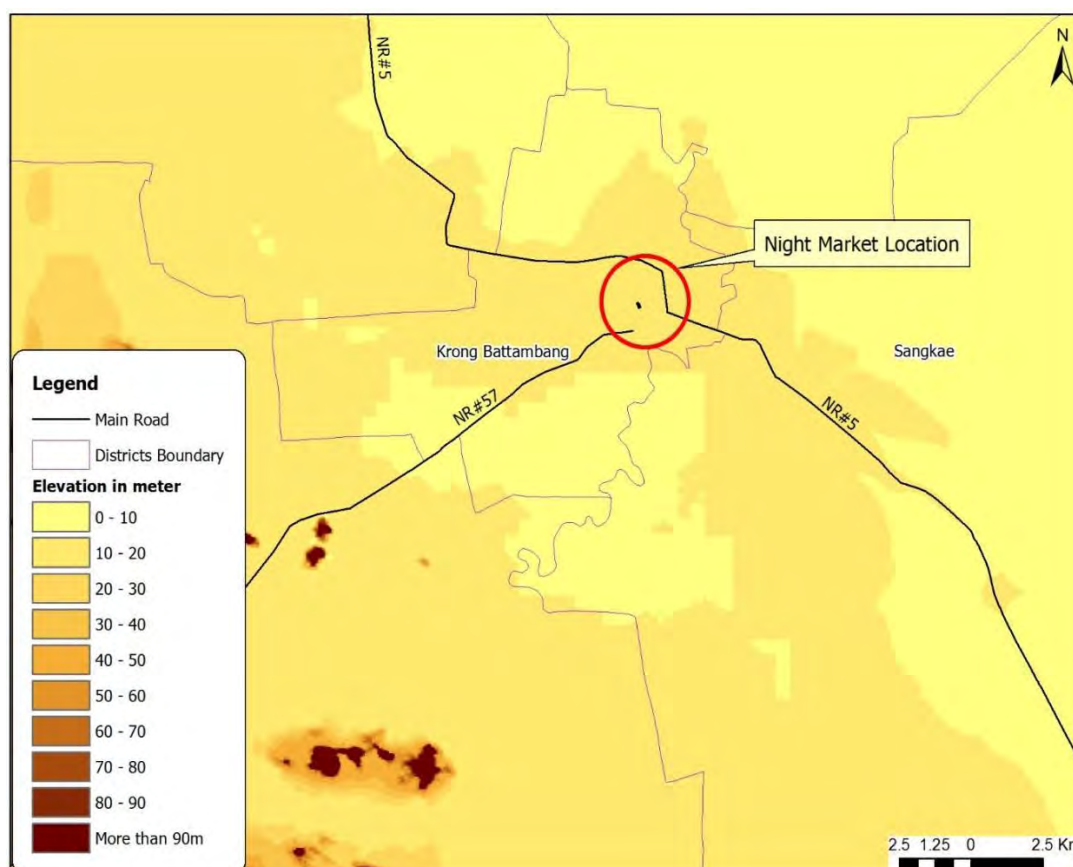


Figure 3: Topographical map around the Project area

<sup>2</sup> Available from <http://www.treeseedfa.org/doc/GeneEcologicalZonation/4DescriptionofEcological.pdf>.

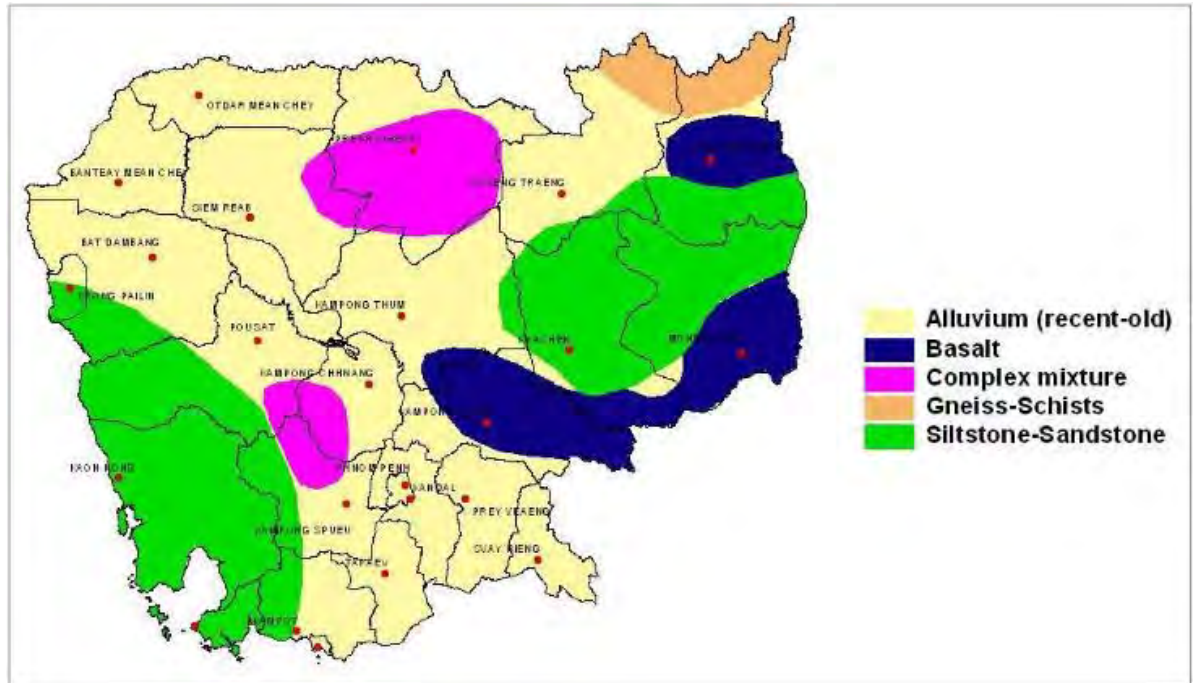


Figure 4: Generalized view of the geology of Cambodia<sup>3</sup>

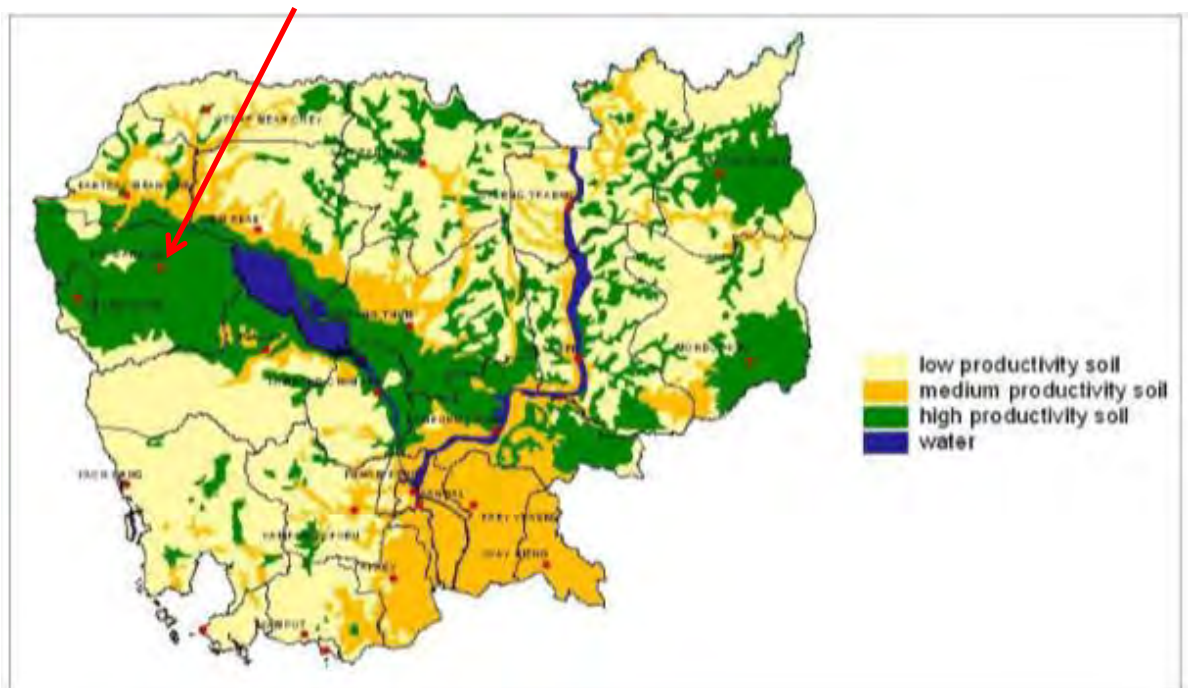


Figure 5: Generalized distribution of soil fertility in Cambodia

<sup>3</sup> Figures 3 and 4 are available from: <http://www.treeseedfa.org/doc/GeneEcologicalZonation/4DescriptionofEcological.pdf>.

## Natural Hazards

Cambodia is exposed to floods, droughts, storms, earthquakes, landslides, and forest fires. Floods and droughts are the main physical hazards and occur regularly, often within the same year. For the period 1987–2007, floods had been more destructive. Storms are occasional events, earthquakes are low intensity, landslides are rain-triggered and occasional, and forest fires are not very common. Flooding is also expected to increase in terms of frequency, severity, and duration with climate change<sup>4</sup>.

Table 3: Natural hazards in Cambodia\*

Earthquakes	Floods	Landslides	Droughts	Storms/ Typhoons	Volcanic eruptions	Tsunamis
X	XXX	X	XX	X	-	-

Disaster matrix by country (1970–2009). ASEAN: Advancing disaster risk financing and insurance in ASEAN member states: Framework and options for implementation. Volume 2: Technical appendices. April 2012. World Bank, GFDRR, ISDR, and ASEAN. Source: DRMI, 2010: 59.

\* Disaster incidence ranges relative from XXX 'high' to X 'low'.

**a) Floods:** There are two major types of floods in Cambodia, namely the Mekong River flood and flash floods. The Mekong River flood occurs in the upper catchments throughout the rainy season, causing a slow, but steady rise in water levels, lasting several days. This causes the Tonle Sap River to reverse its flow, expanding the Tonle Sap Lake to six times its dry-season size. This event is worsened by heavy rains around the Tonle Sap Lake, affecting the provinces around the lake and the southern provinces. This event is most severe when heavy rains coincide with tropical depressions and storms.

Flash floods occur with repeated heavy rainfall in the mountainous areas. Flash floods last for only a few days, but often cause severe damage to crops and infrastructure, particularly in the tributaries around the Tonle Sap Lake. The provinces of Kandal, Kampong Speu, Kampot, Kampong Chhnang, Pursat, Battambang, Kampong Chhnang, Rattanakiri, Preah Vihea, and Odor Meanchey have been, and are prone to flash floods.

**b) Droughts:** There are four characteristics of drought in the country: (i) Unpredictable delays in the onset of rainfall in the early part of the wet season; (ii) erratic variations in the wet season rainfall onset, amount, and duration across different areas; (iii) early end of rainfall during the wet season; and (iv) occurrence of mini-droughts lasting three or more weeks during the wet season, which can damage or destroy unirrigated rice crops. Localized droughts are also becoming increasingly apparent and significant in many areas, including areas that are also flood-affected.

During the monsoon season of 2012, Cambodia experienced both droughts and flash floods. The drought affected 14 provinces and nearly 140,647 hectares (ha) of rice land and damaged some 20,246 ha of rice crops. The worst-affected provinces were Battambang, Svay Rieng, Banteay Meanchey, Oddar Meanchey, Prey Veng, and Takeo.

**c) Storms:** Sheltered by surrounding mountain ranges, storms or typhoons affect Cambodia occasionally. During storms, damages are largely caused by floods. Damage is most severe when storms occur during September and October when seasonal discharge from the Mekong River is high and a second significant peak to annual flooding is generated (MRC 2007).

**d) Earthquakes:** Based on the seismic hazard map of Southeast Asia produced by the Global Seismic Hazard Assessment Program (GSHAP), 1999, Cambodia lies within the middle-low seismic hazard zone with peak ground acceleration of 0.2–0.4 m/s<sup>2</sup> (or 0.02–0.04 g) and a ten percent chance of exceedance in 50 years.

<sup>4</sup> Largely adapted from the Strategic National Action Plan for Disaster Risk Reduction, 2008–2013, the National Committee for Disaster Management, and the Ministry of Planning.

## Climate

Cambodia is situated in a tropical zone, between 10 and 14 degrees latitude north of the equator. Its climate is influenced by the monsoon cycle and has two distinct seasons, the dry and rainy seasons. The northeast monsoon brings in the dry season from November to April. The dry season is cooler from November to January thanks to cool air from Siberia, and is dry and hot from February to April. The rainy season occurs between May and October as the southwest monsoon brings in moisture and rains from the Indian Ocean. Average temperature has minimal variations regionally and seasonally, as shown in Figure 5. The weather is coolest in January and hottest in April. Relative humidity ranges between 70% in March and 85% in September. The rainy season accounts for about 80–90% of the annual rainfall, varying between 1,200 and 2,000 mm across the country. October is the wettest month and January and February are the driest, or experience the least rainfall.

Mean wind speed in Cambodia is low at about 2 m/s. December is known as a month of strong, steady winds from the north. Typhoons, which often devastate coastal Vietnam, rarely cause damage in Cambodia. Annual evaporation is in the range of 2,000–2,200 mm, i.e., highest in March and April at 200–240 mm, and lowest in September and October at 120–150 mm.<sup>5</sup>

In recent years (2010–2014), records at the Battambang Rainfall Station show that the average monthly rainfall is variable due to the wet and dry month and annual rainfall is about 1,300 mm (see Figure 5 and Table 4).

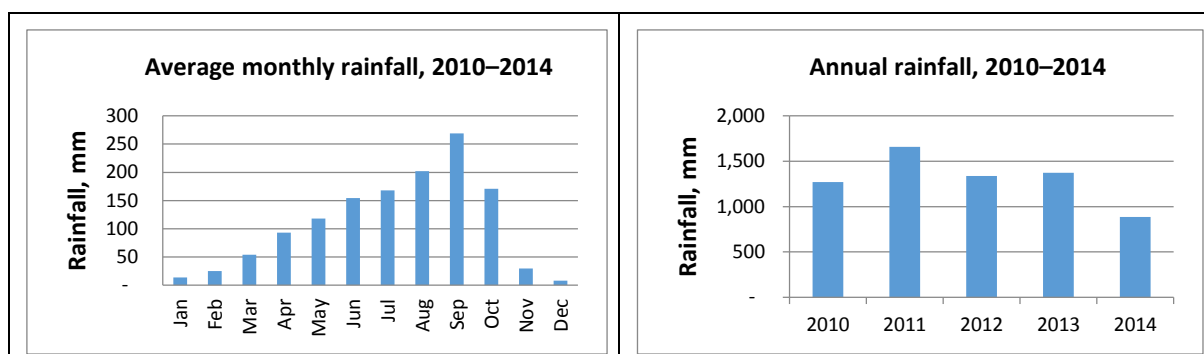


Figure 6: Average monthly and annual rainfall

Table 4: Monthly and annual rainfall of Battambang Province, 2010–2014

Year	Monthly rainfall												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
2010	8.3	12	25.2	69.9	77.3	121.2	232.5	207.6	190.6	325.2	0	0	1,270
2011	0	50.8	35.1	152.7	151.5	107	186.8	253.2	289.1	392.2	34.3	4.2	1,657
2012	16.2	46.3	57.8	56.3	166.2	73.7	133.6	92.3	356.7	249.4	87.9	0	1,336
2013	0	0	21.6	35.6	90.1	277.4	152.4	86.4	311.5	275.9	94.3	28.8	1,374
2014	0	0.4	2.4	84.1	46.9	69.6	191	146.6	88.6	208.7	40.4	6.7	885
Average													1,304

Source: Provincial Department of Water Resources and Meteorology, Battambang Province, as of December 2014.

## Climate Change

<sup>5</sup> Ministry of Environment and UNEP. 2009. *Cambodia Environment Outlook*.

During the period 1971–2010, Cambodia experienced: (i) increasing trends in heat and drought frequency and duration and storm events; (ii) an increasing trend in flood frequency and duration in the initial 30 years and a decreasing trend in the past decade; (iii) an increasing trend in rainfall frequency and intensity during 1971–2000, a tapering-off between 2000 and 2005, and a rising trend again between 2005 and 2010; and (iv) a general rise in storm events.

Climate change projections indicate a rise in temperature of 0.3–0.6°C by 2025, delayed onset of the monsoon, an increase of wet season rainfall, a decrease of dry season rainfall, and more intense flood pulses.<sup>6</sup> General circulation model projections of future Cambodia climate reported in UNDP's Climate Change Country Profile – Cambodia<sup>7</sup>, are as follows:

- Mean annual temperature to increase by 0.7–2.7°C by the 2060s and 1.4–4.3 °C by the 2090s;
- Substantial increases in the frequency of days and nights that are considered “hot” in the current climate: (i) annually, “hot” days to occur on 14–49% of days by the 2060s; 20–68% by the 2090s; and to increase fastest in the summer months of June, July, and August, occurring on 29–96% of the days of the season by the 2090s; (ii) “hot” nights to occur on 24–68% of nights by the 2060s; 38–88% by the 2090s; and to increase fastest in the summer months of June, July, and August, occurring on 73–99% of the nights of the season by the 2090s;
- Increases in mean annual rainfall mainly due to increases in wet season rainfalls in June, July, and August (-11 to +31% by the 2090s) and in September, October, and November (-8 to +42% by the 2090s, but is partially offset by the projected decreases in rainfall in December, January, and February;
- Proportion of total rainfall in heavy events to increase by an additional 0–14% by the 2090s, mainly due to increases in heavy events from June to November, but partially offset by decreases in December, January, and February;
- Increase in the magnitude of 1- and 5-day rainfalls up to 54 mm and 84 mm, respectively by the 2090s, mainly due to increases in rainfalls from June to November.

#### Air Quality

No ambient air quality monitoring has been conducted in and around the proposed project area. Therefore, air quality sample tests for carbon monoxide (CO), nitrogen oxide (NO<sub>2</sub>), sulfur dioxide (SO<sub>2</sub>), and TSP were conducted in the project area. As a result, the concentrations of the tested parameters are lower than the national standard levels limit (Annex A). Ambient air quality is thus currently good since there is no industry found in the Municipality.

#### Surface Water

The Sangke River is approximately 250 km long and provides a good hydrological regime. The river originates from the Samlot Region and flows through the Municipality and joins the Tonle Sap Lake. The River provides amenity value for the Municipality, as well as a main source of drinking water and irrigation water for the surrounding agricultural areas.

The most recent water quality monitoring results in March 2015 at the two sampling locations (upstream and downstream) revealed that total coliform slightly exceeded the drinking standard. This result is related to natural phenomena as well as animal decay, or manure washing into the water body, itself. The pH and DO are slightly higher than the standard levels (Annex A). The results of the water quality analysis are shown in Table 5.

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<sup>6</sup> Chankresna, T. (MEF), Sophal, M. (MoE), and RGC Strategic Program for Climate Resilience in Cambodia. 2011. *Presentation to the PPCR sub-committee*. Cape Town. June 28.

<sup>7</sup> McSweeney, C., New, M., and Lizcano, G. 2010. *UNDP climate change country profiles: Cambodia*. Available from <http://country-profiles.geog.ox.ac.uk/> [Accessed 30 June 2013].



Table 5: Results of water quality analysis of the Sangke River, March 2015

No.	Parameter	Unit	Standards		(S1)	(S2)
			MIME*	MoE**		
1	Temperature	°C	-	-	21.02	21.06
2	pH	-	6.5–8.5	6.5–8.5	8.40	8.91
3	Total suspended solids (TSS)	mg/l	25–100	25–100	180.00	115.00
4	Total dissolved solids (TDS)	mg/l	800	-	501.00	393.00
5	DO	mg/l	2.0–7.5	2.0–7.5	6.93	7.80
6	Turbidity	NTU	5	-	5.00	2.00
7	Nitrite (NO <sub>2</sub> )	mg/l	3	-	ND < 0.10	ND < 0.10
8	Nitrate (NO <sub>3</sub> )	mg/l	50	-	0.29	0.21
9	Sulphate (SO <sub>4</sub> )	mg/l	-	-	0.61	0.46
10	Ammonium (NH <sub>4</sub> )	mg/l	-	-	0.26	0.21
11	BOD	mg/l	1.0–10.0	1.0–10.0	3.95	1.06
12	Chemical oxygen demand (COD)	mg/l	-	1–8	5.86	2.60
13	Total coliform	MPN/100 ml	0	< 5,000	2.9 × 10 <sup>4</sup>	1.2 × 10 <sup>4</sup>

**Note:** \* Ministry of Industry, Mines, and Energy, Drinking Water Quality Standards (MIME DWQS), January 2004.

\*\* Water quality standard in public water areas for bio-diversity conservation (for rivers, lakes, and reservoirs) in Annex 4 of the sub-decree on Water Pollution and Control, April 6, 1999.

## 2. Ecological Environment

The major ecological resource endowment of Battambang is the Tonle Sap Lake which is located in the southeastern part of the Municipality. The lake supplies irrigation water for agricultural production, particularly for the cultivation of rice paddies. It also provides water for domestic use by local residents and business establishments. The major physical feature of Battambang Province is the Sangke River which flows through the Municipality center.

### Flora

The surroundings of the Project area are sidewalks with decorative plants in and at the eastern side, while the western side has some large trees. However, the development Project will not have any impact on them.

### Fauna

Nineteen bird species can be found around the Project area (Annex B, Table 1). However, the map of important bird areas in Cambodia has been reviewed and no vulnerable species have been identified within close proximity of the Project area; there is no wildlife in the area. Meanwhile, the local people still found some reptiles and amphibians (Annex B, Table 2). Thirty-five fish species were commonly found by local people from the Sangke River through family-scale fishing activities (Annex B, Table 3).

### Protected Areas

Cambodia's protected areas in under MoE control. Twenty-three protected and wildlife conservation areas have been created since 1993 (Annex C Table 4). These 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 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. These are detailed as follows:

- **National parks** (IUCN category II) – Natural and scenic areas of significance for their scientific, educational, and recreational value;
- **Wildlife sanctuaries** (IUCN category IV) – Natural areas where nationally-significant species of flora or fauna, natural communities, or physical features require specific interventions 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, pastures, 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 the 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.

However, no protected area is adjacent to the project area.

### 3. Economic Development

#### Economy

Economic activities in the Municipality are largely influenced by the predominant agricultural resource base and the increased trade and traffic flows as a result of the improved transport network and road system. Being an established marketplace, the Municipality's economic activities relate to the main important sector: agriculture. Combined with the fishery and forestry sectors, agriculture has always been the main source of income and livelihood of the majority of the population. Major agricultural activities include rice production, vegetable growing, livestock rearing, poultry rearing, craft works, and raw materials extraction for construction<sup>8</sup>. The Municipality also has suppliers of animal feed, agricultural machinery and fertilizer, brick manufacturers, furniture makers, and other small industrial operations. As for in the Province, as of 2012, there were many new businesses: 54 large and medium companies, 364 small businesses, and more than 340 rice mills. A large processing factory is under construction and will process and package rice, maize, beans, and other agricultural products, and is expected to have a capacity of up to 30 tonnes per hour.

#### Land Use and Urban Development

In 2003, the general land use of the Municipality consisted of agricultural land (mainly rice land), forest cover in the south, shrubland, some grassland, urban/built up areas, and a waterbody (the Sangke River). In recent years, the Municipality has had a land use and zoning map indicating the agricultural, industrial, commercial, and residential zones, and the direction of future physical development of urban growth centers and investments in agro-industrial development (Figure 6).

The major land use category is the agricultural zone which occupies more than 74% or 8,558 ha of the total land area of the Municipality. The residential zone and residential areas with an agricultural zone cover a combined area of more than 1,800 ha or almost 16%. The residential spaces are concentrated within the urban area along medium and small roads. The residential areas with agriculture zones are situated within the sub-urban areas along small to medium roads close to the Municipality border limits.

The mixed-use zones, including all settlement categories in urban, sub-urban, and rural areas, cover a total area of 584 ha, accounting for 5% of the municipal land area. These zones exist along the national roads and main road networks surrounding the commercial center. The small and medium industry zones which are within all settlement categories in urban and sub-urban areas consist of a mix of small-scale enterprises such as vehicle repair shops, construction companies, and small-scale factories, some of which create disturbances (air and noise pollution) in surrounding residential and commercial areas.

Planned development for the urban expansion of the Municipality will cover the eastern and northern portions of the Municipality center. These cover the sangkats of Rottanak and Prey Sdach where there has been increasing economic activity due to the presence of commercial and business establishments, including the public market and trading center in the area<sup>9</sup>.

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<sup>8</sup> ADB. 2012. *Battambang flood control feasibility study, 2012*. ADB TA 7644-REG.

<sup>9</sup> Land use in urban areas of the Municipality, as of December 2014.

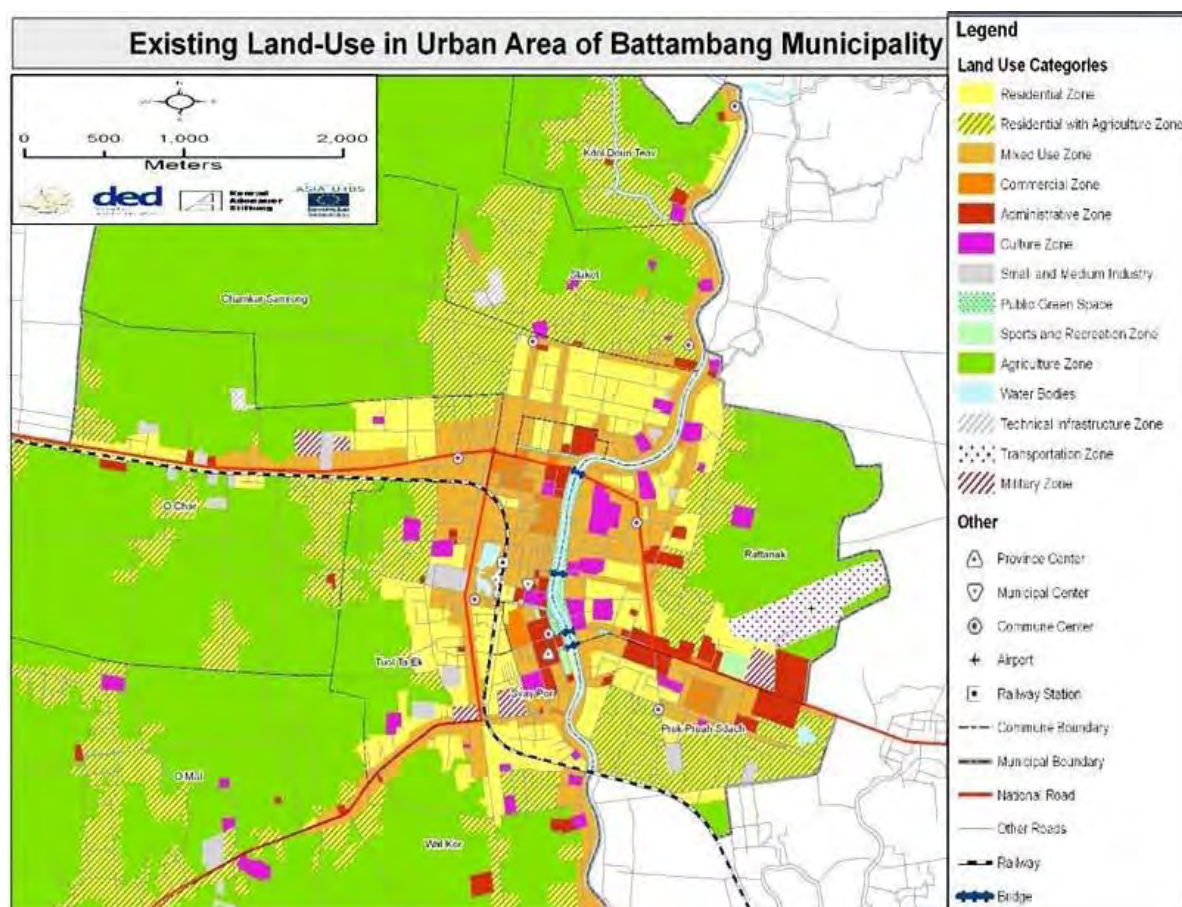


Figure 7: Land use map in the urban area of Battambang  
Source: Municipality of Battambang. 2010. *Technical report on the land use plan.*

## Infrastructure Facilities

### Roads and Transport

The roads within the Municipality are DBST, MAKADAM, concrete, and laterite (Table 6). These are being upgraded (including residential roads). It should be noted that many of the roads lack roadside drains and existing roadside drains are often filled with silt or solid waste. With relatively low traffic on municipal roads, road conditions are generally quite reasonable. The main issue is the flooding of the roads during the wet season and dust and mud on unsurfaced roads during the dry and wet seasons, respectively. There is no formal street sweeping. Streetlights are present mostly along National Road No. 5.

Table 6: Roads and sewerage system, 2013

Description	Total length of roads (m)
DBST, MAKADAM roads	14,728 m
Concrete roads	1,869 m
Laterite roads	6,145 m
Culvert pipes, diameter 30–50 cm	1,015.0 m
Culvert pipes, diameter 60–100 cm	12,958.0 m
Culvert pipes, diameter 100+ cm	1,585.0 m

Sources: PDoP. 2013. Ministry of Planning.

Municipality transport is found to be road based and traffic volumes are growing rapidly. Buses and cars are widely used as public transport from the Municipality to other provinces, while motorbikes and bicycles are the most common form of transportation for local people.

#### Water Supply and Sanitation

The water supply system was originally built in the mid 1950s. According to officials, the waterworks operated jointly with Battambang Electricity until April 1993 but is now an 'autonomous department' that reports to the Department of Industries. The waterworks were in a rundown state until the European Committee (through the agency, SAWA) began to assist its two-year rehabilitation in 1992 and 1994 with operations at 6,000 m<sup>3</sup>/day. Up to 2014, the waterworks had an average supply capacity of 9,397 m<sup>3</sup>/day through development funding agencies such as ADB and the Japan International Cooperation Agency (JICA).

As of December 2014, Battambang Municipality had about 48% safe water access rates due to the insufficient production capacity of existing facilities and low intake volume in the dry season. The water supply system at present is mostly located along the main roads and in urban areas. People also use open wells or direct intake from the Sangke River for daily consumption in places where water supply is unavailable.

Sanitary facilities, in particular, sanitary latrines, are one of several factors to consider when discussing people's health conditions. Based on the 2013 sangkat profile, 100% of families were using sanitary latrines. This may indicate better living standards and knowledge of healthcare.

#### Drainage

The existing wastewater treatment plant (WWTP) in Chamkar Samraong Sangkat (western side of the Sangke River) is not functioning adequately. There are no treatment facilities on the eastern side of the River (including Rotanak and Preak Preah Sdach Sangkats). There are some existing canals for channeling combined wastewater and stormwater, but the water is drained out onto the rice fields without any treatment.

The existing service area of the wastewater and sewerage system in the Municipality is limited to only about ten percent of the Municipality i.e., Svay Pao located on the western side of the Sangke River. The pipe network was constructed in the 1970s and is a combined system carrying both sewage and stormwater runoff, and is connected to the WWTP that was built in 1994. The pipe network has one sewer overflow structure (located along Road 526) which diverts excess stormwater from the system to a nearby canal, thereby limiting wet season flows to the WWTP. The existing sewerage network comprises approximately 23,000 m with pipes ranging from 400 mm in diameter to 1,500 mm. The sewerage network currently serves about 15,000 persons in the town center.

The present WWTP has a design capacity of 2,800 m<sup>3</sup>/d. The WWTP facility consists of two small sedimentation ponds and a larger anaerobic treatment pond which has a retention capacity of about 20 days. The treated effluent is drained into canals and the water is finally discharged into nearby rice and agricultural fields. The WWTP is operating at inefficient levels; it is estimated that 60% of daily wastewater is conveyed by the canals to the river without any form of treatment. Almost all of these discharges are situated downstream of the intake for the Municipality's water supply.

A key measure that can be taken to mitigate this severe environmental pollution is the improvement of the existing wastewater system. This would involve the rehabilitation of the existing system and installation of a new WWTP. This urban environment infrastructure has been included in the provincial and municipality development plans and is considered a priority investment to help achieve the development vision of Battambang<sup>10</sup>.

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<sup>10</sup> World Bank. 2012. *Sustainable water supply and sanitation review, 2012*.

### Solid Waste Management

About 90% of waste generated in urban areas is collected every day in nine of ten sangkats. Other locations' collection is three days a week. Mixed waste is collected, transported, and disposed of at the municipal dumpsite by a private company called CINTRI. Municipal waste separation at source has not yet been practiced, except for Boeng Chhouk Market. With support from the Institute for Global Environmental Strategies (IGES) and the Cambodian Education and Waste Management Organization (COMPED), organic waste is separated for composting and anaerobic digestion.

Waste at the dumpsite has a high organic content estimated to be around 73%, followed by 12% plastic waste, 4% paper, and 2% glass. Waste from Boeng Chhouk Market is composed of 84% organics (fruits and vegetables), 8% plastic, 3% paper, and 5% others. Total waste generation in the Municipality is estimated at 31,968 tonnes/year. Average waste generation per capita is 212 kg/year<sup>11</sup>.

### Electricity

Some 24,727 households in 2013 were connected to the power supply grid (91.3% of total households in the Municipality). This total does not include homes powered by generators or batteries.

### Tourism

Battambang is the main hub of the northwest connecting the entire region with Phnom Penh and Thailand, and serves as a vital link for Cambodia. It is a peaceful and pleasant place. The main parts of the city are situated closed to the Sangke River, a tranquil, small body of water that winds its way through Battambang Province. Many attractive places can be found in the Province, such as Barseat Temple, Wat Ek Temple, Ba Nan Temple, Prasat Snung, Phnom Sam Pov Resort, Boeng Kam Pinh Puoy Resort, and Sek Sak Resort.

Table 7: Tourist arrival in Battambang Province, 2014

Type of tourist	No. of tourists (persons)
Local tourists	437,345
International tourists	89,152
<b>Total</b>	<b>526,497</b>

Source: Provincial Department of Tourism (PDoT) of Battambang, 2014.

<sup>11</sup> Battambang Municipality, Cambodia. 2013. *Solid waste management profile, 2013*.

## 4. Social and Cultural Resources

### Population and Communities

The Municipality covers an area of 115.44 km<sup>2</sup> and consists of ten sangkats and 62 villages. There are a total of 27,071 households. The total population is 150,711, including 76,845 women. It is reported that the population has risen due to increased economic activities. Almost 100% of the population practices Buddhism. Many pagodas are found in the Municipality. Detailed information regarding population and households is shown in Table 8.

Table 8: Households and population

Municipality	No. of households	Population	Female	Average household size
Battambang	27,071	150,711	76,845	5.56

Source: Municipality profile, as of December 2013.

### Ethnic Minorities

There are no indigenous people residing in Battambang Province; the majority of indigenous people in Cambodia are found in the mountainous northeastern part of the country. The Data Book, 2011 reported that there were no families belonging to ethnic minority groups in the Battambang Municipality. Families belonging to other minority groups, such as 679 Khmer Islamic households and 19 Vietnamese households, were recorded.

### Employment and Income

Data for the Municipality from the Data Book, 2011 showed (i) 29.82% of total households reported agriculture as the main occupation; (ii) families that were mainly occupied in providing services represented 63.16% of households; (iii) families that were mainly occupied in craft work represented 3.08% of households; and (iv) families that did not have clear/specific occupations accounted for 3.94% of households (Table 9).

Table 9: Families with specific and non-specific occupations

Sangkat	Occupations			
	Agriculture	Crafts	Services	Not clear/multi
Tuol Ta Aek	1.92	0.94	82.71	14.43
Preaek Preah Sdach	2.88	0.89	94.89	1.34
Rotanak	9.46	12.47	77.78	0.29
Chamkar Samraong	47.43	0.90	46.67	5.00
Sla Kaet	26.68	1.33	71.99	0.00
Kdol Doun Teav	43.12	1.47	50.79	4.62
Ou Mal	70.04	0.17	29.53	0.26
Voat Kor	80.91	0.04	13.62	5.43
Ou Char	28.56	1.29	67.97	2.18
Svay Pao	1.48	9.51	88.49	0.52

Source: NCDD, as of December 2010.



## Poverty

More than a third of Cambodians live below the poverty level<sup>12</sup>. World Food Programme (WFP) surveys showed that poverty rates in the six municipalities around Tonle Sap Lake ranged from 25.0% to 31.8% in 2012. Battambang Municipality had the third-highest poverty rate with nearly 28.0% of its households within the poverty threshold (Table 10).

Table 10: Poor households in the six municipalities around the Tonle Sap Lake

Municipality	Total households	Poor households	Percentage (%)
Kampong Chhnang	6,882	2,133	31.0
Pursat	10,865	6,768	31.8
Battambang	24,166	6,768	28.0
Serei Saophoan	18,555	4,195	22.6
Siem Reap	29,944	7,495	25.0

Source: WFP. Identification of poor households as of August 2012.

## Education

The education system in the country continues to face difficulties such as qualified teaching staff shortages due to low salary levels and a lack of suitable teaching materials (mostly in rural areas). It was reported that literacy levels in the country increased from 62.8% in 1998 (55.3% for females) to 78.3% in 2008 (73.1% for females)<sup>13</sup>. The education level and literacy rates amongst women are usually lower than that of men. It is generally said that people need to complete five grades (primary school) for simple reading and writing and nine grades (secondary school) for accurate writing.

Battambang Municipality is well known as the most attractive destination for education after Phnom Penh. This is because the city possesses numerous public and private institutes (Table 11).

Table 11: Statistics of public education institutions in the Municipality, as of December 2013

Educational institution	No. of schools	No. of classrooms
Kindergarten	24	54
Primary school	36	574
Secondary school	9	174
High school	5	200

Source: PDoP of Battambang, as of December 2013.

There are two primary schools, three secondary schools, and two high schools in the sangkat where the project area is located. On average, the distances from the middle of villages to the primary schools, secondary schools, and high schools are 0.25 km, 0.25 km, and 0.5 km, respectively.

Primary school enrollment rates and the illiteracy rate are shown in Table 12. The enrollment rate was calculated from the total male and female population aged 6–14, while the illiteracy rate was calculated from the total male and female population aged 15–45 in each sangkat (the calculation is based on the sangkat of the Municipality).

<sup>12</sup> USAID-Cambodia. 2011. *Cambodia tropical forestry and biodiversity (118/119) assessment*.

<sup>13</sup> *The national report on final census results, 2008*.

Table 12: Education status

Commune	Enrollment		Illiteracy	
	Total aged 6–14	No. or rate	Total aged 15–45	No. or rate
Tuol Ta Aek	3,278	3,180 or 97.0%	10,220	34 or 0.33%
Preaek Preah Sdach	2,333	2,154 or 92.3%	6,932	34 or 0.49%
Rotanak	2,886	2,462 or 85.3%	7,573	291 or 3.84%
Chamkar Samraong	2,211	2,086 or 94.3%	10,179	170 or 1.67%
Sla Kaet	1,362	1,169 or 85.8%	4,168	86 or 2.06%
Kdol Doun Teav	1,647	1,480 or 89.8%	5,082	127 or 2.50%
Ou Mal	2,028	1,895 or 93.4%	5,618	121 or 2.15%
Voat Kor	2,575	2,424 or 94.1%	8,849	43 or 0.49%
Ou Char	3,705	2,779 or 75.0%	8,081	228 or 2.82%
Svay Pao	5,141	4,716 or 91.7%	8,902	19 or 0.21%

Source: Sangkat profile, as of December 2013.

#### Healthcare

The public healthcare system in the Municipality consists of a provincial hospital, operational district health centers, and a referral health center. The project area's healthcare system is basically one Svay Pao health center. The health center provides free-of-charge medical treatment to all, in particular, children's vaccinations. The medical capacity to deal with major diseases, however, is limited. However, maternal care is quite favorable. Birth delivery is free for poor people with a poor identification card. People without such a card have to pay 50,000 Riel or USD 12.5 for deliveries<sup>14</sup>. Poor households normally go to the center for treatment service. Medium-class households usually use private clinics for medical treatment due to good services and medical supplies.

Major diseases identified at the Svay Pao health center are shown in Table 13.

Table 13: Major diseases recorded at Svay Pao Health Center, 2014

No.	Disease	No. of annual patients, 2014
1	Acute upper respiratory infection	3,237
2	Pneumonia	740
3	Severe diarrhea	498
4	Acute bronchitis	371
5	Mental disorders	200
6	Cough	64
7	Dysentery	54
8	Secondary hypertension	51

#### Archaeological/Cultural Sites

There are no physical cultural resources that will be affected by the proposed project. There have no reports of archaeological/historical discoveries reported, according to the sangkat councils.

<sup>14</sup> Svay Pao Health Center, as of December 2014.



# Chapter 5 - Anticipated Environmental Impacts and Mitigation Measures

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The aim of this chapter is to determine the Project's environmental impacts on natural and social resources as they may occur during pre-construction, construction, and operation and maintenance.

## 1. Positive Environmental Impacts and Benefits

Construction work will employ local people and increase incomes; the construction contractor will be encouraged to maximize local employment. The contractor should, however, also provide sufficient training prior to starting work. Moreover, local construction materials suppliers and other businesses will be more active or gain benefits from construction.

During the operation, Municipality infrastructure will improve, and locally-produced products are expected to be more marketable. Economic activities will be more active and significantly contribute to a qualitative improvement in the lives of street and other related vendors of the Municipality. It will also result in improved overall Municipality face as well as economic and social development.

## 2. Screening of Potential Impacts

The list of anticipated impacts was identified using ADB's REA checklist parameters for urban development projects through field investigations. The screening process revealed the following salient siting concerns: (i) structures within the site; (ii) street vendors on the eastern site, which is close to the Sangke River that need to be carefully considered in design to mitigate health and safety hazards and occupational constraints during construction; and (iii) the Sangke River, which is about 30 m from the project location and will be exposed to impacts during construction.

## 3. Impacts and Mitigation Measures Related to Siting and Design

In the preparation of the feasibility study, the following mitigation measures have been undertaken to minimize the project's environmental and socioeconomic impacts:

- The Project has been prepared within a highly consultative manner to inform stakeholders about it and obtain information on priority needs and concerns;
- The Project location has taken into careful consideration the existing conditions;
- The Project's preliminary design has: (i) carefully studied and incorporated climate change and natural impacts; and (ii) specified protection from heavy rainfall.

## 4. Impacts and Mitigation Measures during Construction

### Impacts on Air Quality

Dust/suspended particles, gas emissions, and noise and vibration, arising from construction activities, practices, and materials will be more salient during the construction period, which is estimated to be at least 20–30% of the entire timeframe. These impacts will be temporary but, if not mitigated, will have the potential to cause long-term effects on the health of construction workers and passengers passing by.

#### Impacts on Water Resources

The Sangke River may be at risk of pollution from: (i) poorly-managed construction materials and wastes and hazardous substances; and (ii) poor sanitation practices of construction workers. This should be carefully considered as the River is used as a Municipality water supply source.

#### Impacts on Soil

Soil pollution, which is of low significance, may be caused by leaking or spilling of construction materials such as fuel/oil and cement. Fuel/oil shall, therefore, be handled and stored carefully to prevent leakages and spills. Waste oil shall be collected, stored in drums, disposed of at a site approved by the local authority, raised off the ground, covered to keep rain out, and surrounded by a bund to contain spills and simplify clean up operations.

#### Impacts on the Landscape

The construction of the proposed night market will be implemented in the dry season. During this time, the landscape will partially be in hidden views. Excavations, indiscriminately-parked construction vehicles and equipment, stockpiles of aggregates, storage structures, sanitation facilities, and construction supplies/materials will disturb (or further disturb) the landscape. However, temporary and low in significance, this could be mitigated with planned and enforced orderly placement of construction amenities and stockpiles, and the observance of vehicle and equipment parking.

#### Impacts on the Ecological Environment

The proposed project area is not in or near any protected area. The proposed works are within the public park where some infrastructure renovations are allowed with approval. A few decorative trees within the project area may be removed. A plan to replace the removed trees can be one of the detailed design outputs. Decorative trees outside the project area (along sidewalks) will be potentially subject to trampling or damage from construction vehicles/equipment, stockpiles of aggregates, storage structures, and the workers. This can be mitigated through: (i) the determination of the land required for work easement during detailed design; and (ii) the installation of adequate physical demarcation during construction mobilization to ensure confinement of construction activities within the project area.

#### Impacts on the Socioeconomic Environment

The proposed night market's construction will generate medium impacts on street vendors (at the eastern part) during the construction period. Hence, the discussion on impacts on the socioeconomic environment may also be of concern.

Traffic volume in the Municipality is currently low. The construction work will restrict traffic on the streets around the site. Therefore, the blocking of access to houses, properties, businesses, markets, and social institutions cannot be avoided. However, traffic impacts will be low with mitigation measures in place and prior consultation and coordination with concerned local authorities.

The health and safety of construction workers will be a low risk element during construction. These people will be directly and indirectly exposed to threats from the construction's impacts on air quality, noise, and vibration. Regarding communities' health due to the project location and construction duration, communicable and transmittable diseases may not be brought into the site and its surrounding areas by the construction workers.

#### Mitigation Measures

Some recommended mitigation measures for salient impacts during construction are as follows:

##### *Air pollution due to dust:*

1. Water stockpiles of materials and exposed surfaces at least once a day to reduce dust;
2. Ensure trucks, especially those hauling natural aggregates, cement, and solid wastes, are adequately covered and maintained;

3. Enforce slower maximum speed to and from the Project area.

#### *Noise*

4. Enforce the use of only well-maintained vehicles and equipment with efficient mufflers;
5. Limit noisy operations during the daytime;
6. Use the least noisy equipment, e.g., electrically-powered ones.

#### *Traffic*

7. Prepare a traffic management scheme with the Municipality;
8. Manage truck arrivals and departures efficiently;
9. Post traffic flagmen at the work site.

#### *Accidental damage to utilities and service infrastructure*

10. During mobilization, coordinate with the Municipality for the exact location and set contact arrangements in case of damage;
11. In case of accidental damage, immediately inform the Municipality and/or the Project Management Unit (PMU).

## 5. Impacts and Mitigation Measures during Operations

During operations, the main potential direct impacts are expected to be few:

#### *Solid Waste Management*

Considering the nature of the Project, it is expected that a considerable volume of waste will be generated at the site. The lack of a proper mechanism for disposal will lead to foul smells and a deterioration of the aesthetic value of the Municipality.

#### *Noise Levels*

During the project operation, a number of street vendors will deliver locally-produced products and other products on a daily basis. This could result in medium-noise level disturbances for communities residing nearby.

#### *Mitigation Measures*

Generally, the magnitude of impacts arising from the operation will depend highly on the degree of environmental considerations made from the start of project development to operations. Some basic measures are: (i) sufficient provision in the annual budget for operations; and (ii) ensuring that operators engage/designate a staff to oversee EMP implementation, and prepare the required environmental monitoring reports (EMRs). A detailed set of mitigation measures are shown in the EMP (Annex G).

## 6. Indirect, Cumulative, and Induced Impacts

#### *During Construction*

The proposed works will not generate indirect, cumulative, and induced impacts as there are no concurrent development projects around the project area.

#### *During Operations*

Indirect, induced, and cumulative impacts will not be generated from operations. The Municipality will expect overall positive benefits, impacts, and outcomes to lead to more economic activity.

## 7. Unanticipated Impacts during Construction and Operation

In the event that unanticipated impacts become apparent during construction and operation, the EA will: (i) inform and seek ADB's advice; (ii) assess the significance of such unanticipated impacts; (iii) evaluate available options to address them; and (iv) update the IEE, including the EMP. ADB will help the EA mobilize the resources required to mitigate any adverse unanticipated impacts.

## Chapter 6 - Public Consultation and Information Disclosure

Stakeholder consultations were conducted for the Project. The consultations were based on the principles of meaningful engagement, transparency, participation, and inclusiveness to ensure that all relevant stakeholders were given equal opportunities to participate in project design. The consultations also provided means and opportunities for stakeholders to continue to be engaged during Project implementation.

The overall objective of the consultations was to obtain views and ideas regarding development status, constraints, and possible opportunities to resolve such constraints through project-related interventions, and to duly reflect them in plan preparations. This was done to improve design, construction, and operations and maintenance, and take initiatives accordingly, to derive maximum benefits (the list of participants interviewed during the consultative process is given in Annex D).

### 1. Identification of Stakeholders

Stakeholders were identified in a participatory and flexible manner. To date, stakeholder communication has focused on institutional stakeholders and street vendors near the project area. The stakeholders of project design and implementation include:

- 1) Institutional stakeholders, including the Municipality, relevant provincial departments, and local authorities responsible for project management and implementation;
- 2) Street vendors in the eastern part of the project area who may be directly and/or adversely affected.

### 2. Summary of Public Consultation and Project Response

The results of the public consultations conducted as part of the IEE showed overwhelmingly positive support for the Project. Table 14 summarizes comments from different project stakeholders and indicates that negative stakeholder views were limited to street vendors' concerns of occupation during construction and operations.

Table 14: Summary of stakeholder views for the Project

Stakeholder	Views of project components
Municipality	<ul style="list-style-type: none"><li>- Full support for the Project;</li><li>- No major concerns;</li><li>- Municipality environment will be improved;</li><li>- The Project will improve the face of the Municipality and provide more economic activities;</li><li>- Pace the study so that the Project can be completed quickly.</li></ul>
Provincial Department of Public Works and Transport	<ul style="list-style-type: none"><li>- Fully support for the Project;</li><li>- No major concerns;</li><li>- The Project will organize street vendors;</li><li>- Street vendors' occupations will be improved.</li></ul>
PDoE	<ul style="list-style-type: none"><li>- Full support for the Project;</li><li>- No major environmental concerns;</li><li>- The Project will improve Municipality environment as there is currently no proper solid waste management system and wastewater</li></ul>

Stakeholder	Views of project components
	is discharged directly into the Sangke River.
PDoP	<ul style="list-style-type: none"> <li>- Full support for the Project;</li> <li>- No major concerns regarding the environment;</li> <li>- Street vendors' living standards will improve;</li> <li>- Department willingness to cooperate with the Project.</li> </ul>
Provincial Department of Tourism (PDoT)	<ul style="list-style-type: none"> <li>- Full support for the Project;</li> <li>- No major concerns;</li> <li>- The Municipality will be able to attract more tourists;</li> <li>- The Project will help the poor;</li> <li>- The Municipality's economic activities will improve.</li> </ul>
Sangkat council	<ul style="list-style-type: none"> <li>- Full support for the Project;</li> <li>- No major concerns;</li> <li>- Municipality environment will improve as there is currently no proper solid waste management and wastewater is discharged directly into the Sangke River;</li> <li>- The Project will help the poor.</li> </ul>
Street vendors	<ul style="list-style-type: none"> <li>- Street vendors will move into the new project location provided a sufficient number of them agree to do so;</li> <li>- Temporary impacts on occupation may occur during construction;</li> <li>- The new project location may decrease incomes during operations.</li> </ul>

### 3. Information Disclosure

Safeguard documents will be disclosed at the Municipality office: (i) project component descriptions and activities; (ii) expected period of construction; (iii) positive impacts and benefits of components; (iv) potential impacts and mitigation measures, particularly during construction and operations; (v) environmental monitoring; (vi) existence and general overview of a GRM; and (vii) status of compliance with RGC and ADB safeguards requirements.

The IEE (in both English and Khmer), as well as the MoE-approved IEE Report (in Khmer), will be available at the offices of the PMU and Implementing Agency for all interested parties. Copies will be made available upon formal request. The IEE and EMRs will be available on ADB's website.

# Chapter 7 - Grievance Redressal Mechanism

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## 1. Purpose of the Mechanism

The GRM is used as a mean of redressal for persons seeking satisfactory resolution of their complaints about the environmental performance of the Project. The mechanism will ensure that: (i) the basic rights and interests of every person adversely affected by the environmental performance of the Project, are protected; and (ii) their concerns are addressed effectively and in a timely manner. It should be noted that the Project may encounter environmental performance-related complaints.

## 2. Proposed Setup

There is no existing legally-established system to resolve environmental concerns and complaints. As the Project's executing agency (EA), The MPWT will establish the GRM. The setup shall be made before commencement of site works and invite members from the PMU, the project implementation unit (PIU), and the Municipality and sangkat councils. 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. The PMU's environmental safeguard officer (ESO) will oversee the implementation of the mechanism and be responsible for keeping the PMU informed. Access points will be set up at the Municipality level.

The GRM will accommodate both formally- and informally- lodged, but eligible, grievances. Informally-lodged grievances are those received by the contractor during construction. Formally-lodged grievances are those received at the offices of the PIU and Municipality. The PIU evaluates complaints for eligibility. The PIU and PMU maintains a record of *all* lodged grievances. The PMU will inform ADB as necessary and report on the implementation of the GRM in the monthly progress reports and in the periodic EMR that will be submitted to ADB.

Sufficient support systems, including well-oriented GRM staff will be in place to sustain the effective implementation of the mechanism. These include an access point at the Municipality level, communication facilities, documentation and recording, a reporting system, funds, and posters declaring contact details displayed at a specific location.

## 3. Access to the Mechanism

Any person who has environmental issues pertaining to the Project during the detailed design, construction, and operations phases will have access to the mechanism free-of-charge. The PMU will ensure the following through its ESO and staff in the PIU:

- The public, especially residents and regular passersby, are aware of their rights to access, and will have access to the GRM for free (no administrative or legal charges);
- The GRM is fully disclosed prior to construction: (a) in public consultations, (b) through posters displayed in the Municipality office (posters will include the names and contact details of the head and the ESO).

## 4. GRM Steps and Timeframe

Grievances raised on environmental impacts are critical to the health and safety of affected persons (APs). Hence, the proposed mechanism intends to be easily accessible and promptly responsive to APs' complaints.

Informal Approach

Informally, APs can lodge complaints directly with the contractor during construction. The contractor will document and assess the complaint immediately. If assessment validates the complaint as within the scope of the GRM, the contractor will act on it within three days (from receipt of complaint). If assessment invalidates the complaint (i.e., finds the complaint ineligible or irrelevant to the project's environmental performance), the contractor will direct the AP to the Municipality. He/she will then report to the PIU that the complaint has been received, eligible or ineligible, and describe actions to be taken, within two days from receipt of complaint. The PIU will obtain written confirmation of satisfaction from the AP within seven days from completion of resolution by the contractor.

#### Formal Approach

If a complaint is eligible, but not acted upon within three days from receipt of complaint, or if AP is not satisfied with the resolution undertaken by the contractor, he/she can access the formal mechanism described below:

##### Step 1 *Lodging a complaint (day 1)*

The AP will lodge a complaint himself/herself, or with assistance from the village chief at the access point of the Municipality.

##### Step 2 *Documenting and registering a complaint (day 1)*

The Municipality will document/register the lodged complaint, ensure it is duly referenced, and provide the AP with a copy of the referenced complaint, and then forward the documented complaint to the PIU.

##### Step 3 *Assessing and discussing a complaint (day 1–3)*

The AP will be informed whether or not the grievance is eligible or ineligible. If ineligible, the AP will be informed of the resolution. If eligible, the AP will be informed of the expected action timelines as set out in the established mechanism.

The complaint will be immediately reviewed, investigated, and discussed if both the AP and contractor are available. If not, both parties will agree to undertake the review, investigation, and discussion within three days. The discussion will center on the cause and action/measure to implement, based on the review and investigation. Agreements on actions and measures and the time involved will be made with the AP. Agreements will be properly documented and filed, and the PIU, Municipality, and AP will all receive copies.

##### Step 4 *Implementing the agreed-upon resolution (day 3–4)*

If the complaint is minor—not requiring further investigation—and would be easy to resolve, the contractor will immediately implement an agreed upon action/resolution (day 3/4–day 7/8). If further investigation is deemed necessary, the contractor will: (i) immediately provide the most suitable interim measure to reduce the magnitude of the impact; and (ii) start working on final measures within five days of the discussion/meeting.

##### Step 5 *Resolution acceptance (one week after completion of action/measure taken)*

If an AP believes the impact has been resolved satisfactorily, the PIU will obtain written confirmation of satisfaction from the AP. This confirmation will signify the closure of the grievance and will form part of the grievance documentation. The Municipality and AP will retain copies of the confirmation.

##### Step 6 *Monitoring and evaluation (for one week after closure of grievance)*

The PIU will monitor the effectiveness of the resolution for at least a week after closure of grievance (i.e., when the action implemented has been satisfactorily confirmed in writing by the complainant). Monitoring and evaluation will be properly documented and included in the EMR.

##### Step 7 *Appeal for dissatisfied APs*

If and when dissatisfied (or in the event the impact persists despite actions being undertaken), the AP can appeal to the Municipality for assistance from the provincial authority. The provincial authority will call all parties concerned to review the history of the grievance and resolution process, and assess the appeal's validity.



If the appeal is deemed invalid, the provincial authority will write to the AP and declare the grievance closed. If the appeal is assessed to be valid, the provincial authority and concerned parties will discuss and agree on a quick resolution. The PMU requires the contractor to implement the agreed resolution. Should the issue continue to persist despite the second action, dissatisfied APs can raise an appeal in the provincial court.

In the event of an appeal, the PIU will immediately report to the PMU. The PMU will ensure that ADB is immediately informed.

# Chapter 8 - Environmental Management Plan

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The project EMP has been developed. It will serve as the framework for environmental management commencing from the detailed design phase through to operations. The full implementation of the EMP by the works contractor will ensure that adequate protection measures are in place to avoid or mitigate project impacts. The requisite EMP has been prepared and is attached in Annexes G and H.

The general EMP is included as part of the special provisions of the specification and performance requirements (one of the sections in the documents for procurement contracts for civil works). The works contractor will incorporate the EMP into his/her planning and site control, and will be required to prepare an EMP for the works and report periodically.

## 1. Mitigation and Monitoring Plans

The recommended mitigation measures consist of activities and plans that need to be undertaken, observed, obtained, prepared to prevent, and mitigate adverse impacts. Specific measures are presented in the environmental mitigation plan (Annex G). The plan attempts to be comprehensive; it points out that most measures are the usual good engineering practices and facilitates monitoring/random inspections by the PMU/PIU.

The environmental monitoring plan is presented in Annex H. Monitoring activities and findings will be documented for the purposes of reporting, verifying, referring on, and evaluating the Project's environmental performance. The documentation will also be used as a basis in correcting and enhancing further environmental monitoring.

## 2. Reporting Plan

Regular reporting on the implementation of mitigation measures and on monitoring activities during the construction phase is required. Reporting is the responsibility of the PMU and should be conducted in conjunction with regular stakeholder meetings. The mitigation and monitoring plans (Annexes G and H) summarize the proposed timing of reporting. An EMR will be prepared on a quarterly basis by the ESO for the EA and sent to the MoE and ADB.

## 3. Implementation Arrangements

### Implementation Schedule

Environmental management will be implemented using the detailed design phase through to construction and operations phases. The duration of the detailed design phase is six months, which is the same as the duration of the construction phase.

### Institutional Responsibilities

The management framework overseeing the implementation of the EMP will be defined by: i) the MPWT (the EA of the Project, who is responsible for promoting urban environmental infrastructure); and ii) the Provincial DPWT who will serve as the PIU.

The EA will form a PMU to oversee project implementation and will assign qualified staff to the PMU to serve as full time ESOs. The ESOs will assist the PIU. The PMU will manage the Project's day-to-day activities. The ESO will oversee and monitor EMP implementation with technical support from the PIU. More specific responsibilities are presented in Table 15.

Table 15: Institutional responsibilities

Chapter 9 - Institution	Chapter 10 - Prior to construction	During construction	During operation
MPWT	<ul style="list-style-type: none"> <li>Firm up the necessary collaboration with the MoE for the Project's compliance with RGC's environmental safeguards requirements on IEE and EMP implementation.</li> </ul>	-	-
PMU	<ul style="list-style-type: none"> <li>Update the IEE and EMP, as necessary.</li> <li>Coordinate with design consultants to ensure the incorporation of updated findings and mitigation measures in design and bidding documents.</li> <li>Ensure that the EMP is part of the bidding documents.</li> <li>Ensure that MoE approval of the IEE report has been secured prior to awarding civil works.</li> </ul>	<ul style="list-style-type: none"> <li>Conduct inspections and checks to monitor the performance of the contractor in implementing the EMP</li> <li>Review the contractor's monthly EMR.</li> <li>Prepare the EMR for submission to ADB.</li> </ul>	<ul style="list-style-type: none"> <li>Conduct inspections and checks to monitor the performance of the operator in implementing the EMP.</li> <li>Review the operator's monthly EMR.</li> </ul>
DPWT	<ul style="list-style-type: none"> <li>Firm up the necessary collaboration with the PDoE and relevant provincial agencies on matters concerning the Project's environmental management.</li> </ul>	-	-
PIU	<ul style="list-style-type: none"> <li>Coordinate and collaborate with relevant provincial agencies, as necessary.</li> <li>Conduct and disclose an updated IEE and EMP.</li> <li>Establish baseline environmental quality of the environmental quality monitoring as prescribed in the EMP by engaging a licensed laboratory.</li> <li>Prepare a draft EMR and submit it to the PMU for finalization.</li> </ul>	<ul style="list-style-type: none"> <li>Review the contractor's monthly EMR and submit it to the PMU.</li> <li>Prepare the draft EMR and submit it to the PMU for finalization.</li> <li>Ensure/manage the observance of the GRM.</li> </ul>	<ul style="list-style-type: none"> <li>Review the operator's monthly EMR and submit it to the PMU.</li> <li>Prepare the draft EMR and submit it to the PMU for finalization.</li> </ul>

#### 4. Preliminary Costs

Based on the initial estimation, the marginal cost for implementing the EMP is USD 3,540 (Annex H). This covers environmental monitoring prior to, and during, construction. The estimated costs: (i) include taxes and contingencies for deficiencies in assumed unit costs; (ii) exclude ESO salaries as there will be existing MPWT staff assigned to the PMU for the Project's environmental management; and (iii) exclude funds spent by the PMU for compliance with Cambodia's safeguards requirements.

## Chapter 9 - Conclusion and Recommendations

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The proposed night market development project is unlikely to cause significant adverse impacts. They have been deemed to be *not* environmentally critical and not within, or adjacent to environmentally-sensitive areas. The Project has been designated as Category B of ADB's Guidelines, which means IEE is sufficient.

The few adverse direct impacts during construction are expected to be local and will be temporary and short-term; they will most likely occur during the peak construction period. These impacts can be mitigated to acceptable levels without difficulty using proper engineering designs and incorporating recommended mitigation measures. They will not be sufficient to threaten or weaken surrounding resources and will not be critically harmful to environmental health.

Full EMP implementation by the contractor will put in place adequate mitigation measures against Project impacts.

The proposed project will improve Municipality infrastructure, resulting in locally-produced products becoming rapidly marketable. Economic activities will then be more active and significantly contribute to a qualitative improvement in the lives of street and other related vendors in the Municipality.

Overall, the Project will significantly improve the Municipality and contribute to economic and social development.

The Project should therefore proceed to ***a detailed design stage***.

# **ANNEXES**

# Annex A – Analysis Reports: Air Quality and Water Quality

## Air quality



**ក្រសួងបរិស្ថាន**  
**នាយកដ្ឋានគ្រប់គ្រងគុណភាពបរិស្ថាន**  
**ការិយាល័យពិសោធន៍ និង វិភាគ**  
**Ministry of Environment**  
**Department of Pollution Control**  
**Laboratory Office**

**ព្រះរាជាណាចក្រកម្ពុជា**  
**ជាតិ សាសនា ព្រះមហាក្សត្រ**  
**Kingdom of Cambodia**  
**Nation Religion King**

លេខ /N°/.....៥០.៧.៧.....

### ព្រឹត្តិប័ត្រលទ្ធផលវិភាគ

#### Analysis Report

Name of Company: Key Consultants (Cambodia)  
 Survey Point: ចំណុចស្ថានីយ៍ត្រួតពិនិត្យគុណភាពខ្សែបណ្តាញទឹកស្ទឹងស្រីស្រី ភូមិក្រាំងម្លូក ឃុំស្រីស្រី សង្កាត់ស្វាយរៀង ក្រុងបាត់ដំបង ខេត្តបាត់ដំបង, UTM 48 P 0304744/1448116  
 Sampling date: March 27, 2015  
 Sampling Period: 09:30 AM to 09:30 AM next day

Table Result of Air Quality Monitoring

លរ No	ប៉ារ៉ាម៉ែត្រ Parameter	ឯកតា Unit	លទ្ធផល Result	ស្តង់ដារ Standard	វិធីសាស្ត្រវិភាគ Reference Method
1	Carbon Monoxide (CO)	mg /m <sup>3</sup>	1.50	20	Method Detection Tube
2	Nitrogen Dioxide (NO <sub>2</sub> )	mg /m <sup>3</sup>	0.027	0.1	Method Saltzman Method
3	Sulfur Dioxide (SO <sub>2</sub> )	mg /m <sup>3</sup>	0.019	0.3	Method Pararosaniline Method
4	Total Suspended Particles (TSP)	mg /m <sup>3</sup>	0.198	0.33	Method Weight Concentration Measuring

បានឃើញនៅ ថ្ងៃទី ៣០ ខែ ៥៧ ឆ្នាំ២០១៥

ប្រធាននាយកដ្ឋាន  
 Was seen on date:  
 Director Department



ហេង-ឧត្តម

ចេញអោយនៅ ថ្ងៃទី ៣០ ខែ ៥៧ ឆ្នាំ២០១៥

ប្រធានការិយាល័យ  
 Date of Issue:  
 Laboratory Chief



ហេង ឌី

លេខ ៤៨ ក្រវីលី ព្រះសីហនុ ទន្លេបាសាក់ ខណ្ឌចំការមន ភ្នំពេញ ទូរស័ព្ទលេខ: ០២៣ ២១០ ៤៩២

Upstream water quality



**ក្រសួងបរិស្ថាន**  
**នាយកដ្ឋានគ្រួសារនិងគ្រប់គ្រងបរិស្ថាន**  
**ការិយាល័យពិសោធន៍ និង វិភាគ**  
**Ministry of Environment**  
**Department of Pollution Control**  
**Laboratory Office**

លេខ / N°: ៤១-២០៧៨.....

**ព្រះរាជាណាចក្រកម្ពុជា**  
**ជាតិ សាសនា ព្រះមហាក្សត្រ**

**Kingdom of Cambodia**  
**Nation Religion King**

**ព្រឹត្តិប័ត្រលទ្ធផលវិភាគ**  
**Analysis Report**

ប្រភពសំណាក/Sample Source : ក្រុមហ៊ុន Key Consultants (Cambodia) ថ្ងៃ ខែ ឆ្នាំទទួលសំណាក/Date: March 27, 2015 ប្រភេទសំណាក/Type of Sample: Sample S-1 (Upstream), សំណាកទឹកស្ទឹងសង្កែ ក្រុងបាត់ដំបង ខេត្តបាត់ដំបង						
លរ No	ប៉ារ៉ាម៉ែត្រ Parameter	ឯកតា Unit	លទ្ធផល Result	ស្តង់ដារ Standard	Method LDL	វិធីសាស្ត្រវិភាគ Reference Method
1	pH	-	8.40	6.5-8.5	4.0	Method MAJI meter
2	Temperature	°C	21.02	NV	NV	Method MAJI meter
3	Turbidity	NTU	5.00	NV	0	Method MAJI meter
4	Total Dissolved Solid (TDS)	mg/l	501.00	NV	0	Method MAJI meter
5	Dissolved Oxygen (DO)	mg/l	6.93	2.0-7.5	0.0	Method MAJI meter
6	Total Suspended Solid (TSS)	mg/l	180.00	25-100	NV	Method 2540 D
7	Biochemical Oxygen Demand (BOD)5	mg/l	3.95	1.0-10	NV	Method 5210 B
8	Chemical Oxygen Demand (COD) Mn	mg/l	5.86	8.0 (MRC)	NV	Method JIS K 0102
9	Ammonium (NH4)	mg/l	0.26	NV	0.1	Method ICs 90
10	Nitrite (NO2)	mg/l	ND	NV	0.1	Method 4500-NO2 C
11	Nitrate (NO3)	mg/l	0.29	NV	0.1	Method 4500-NO3 C
12	Sulfate (SO4)	mg/l	0.61	NV	0.1	Method 4500-SO4 <sup>2-</sup> B
13	Total Coli form	MPN/100ml	2.9x10 <sup>4</sup>	5000	0	Method NF T90-413

សំគាល់: 1- ការយកសំណាក ការរក្សាទុក និងការដឹកជញ្ជូនសំណាកទឹកមកមន្ទីរពិសោធន៍ត្រូវប្រើប្រាស់ (តំបន់) អនុវត្តដោយខ្លួនឯង។  
 2- Standards កំរិតកំណត់ស្តង់ដារគុណភាពទឹកនៅតាមតំបន់ទឹកសាធារណៈសំរាប់អភិរក្សជីវៈនៅក្នុងទឹក និងសំរាប់ការការពារសុខភាពសាធារណៈ។  
 3- LDL mean Lowest Detection Limit, ND Mean Not Detected (Lower than LDL), NV Mean No Value.

បានឃើញនៅ ថ្ងៃទី ០៥ ខែ ឧសភា ឆ្នាំ២០១៥

ប្រធាននាយកដ្ឋាន  
 Was seen on Date  
 Director Department

ហេង-ណារ៉េនី

ចេញអោយនៅ ថ្ងៃទី ០៥ ខែ ឧសភា ឆ្នាំ២០១៥

ប្រធានការិយាល័យ

Date of Issue:  
 Laboratory Chief

*(Signature)*

តេច ឡុង

លេខ ៤៨ រុក្ខវិធី ព្រះសីហនុ ទន្លេបាសាក់ ខណ្ឌចំការមន ភ្នំពេញ ទូរស័ព្ទលេខ: ០២៣ ២១០ ៤៩៦



Downstream water quality



**ក្រសួងបរិស្ថាន**  
**នាយកដ្ឋានគ្រប់គ្រងគុណភាពបរិស្ថាន**  
**ការិយាល័យពិសោធន៍ និង វិភាគ**  
**Ministry of Environment**  
**Department of Pollution Control**  
**Laboratory Office**

លេខ / N° : ០១-២-២៧៣

**ព្រះរាជាណាចក្រកម្ពុជា**  
**ជាតិ សាសនា ព្រះមហាក្សត្រ**

**Kingdom of Cambodia**  
**Nation Religion King**

**ព្រឹត្តិប័ត្រលទ្ធផលវិភាគ**  
**Analysis Report**

ប្រភពសំណាក/Sample Source : ក្រុមហ៊ុន Key Consultants (Cambodia)						
ថ្ងៃ ខែ ឆ្នាំទទួលសំណាក/Date: March 27, 2015						
ប្រភេទសំណាក/Type of Sample: Sample S-2 (Downstream), សំណាកទឹកស្ទឹងសង្កែ ក្រុងបាត់ដំបង ខេត្តបាត់ដំបង						
លរ	ប៉ារ៉ាម៉ែត្រ	ឯកតា	លទ្ធផល	ស្តង់ដារ	Method	វិធីសាស្ត្រវិភាគ
No	Parameter	Unit	Result	Standard	LDL	Reference Method
1	pH	-	6.91	6.5-8.5	4.0	Method MAJI meter
2	Temperature	°C	21.06	NV	NV	Method MAJI meter
3	Turbidity	NTU	2.00	NV	0	Method MAJI meter
4	Total Dissolved Solid (TDS)	mg/l	393.00	NV	0	Method MAJI meter
5	Dissolved Oxygen (DO)	mg/l	7.80	2.0-7.5	0.0	Method MAJI meter
6	Total Suspended Solid (TSS)	mg/l	115.00	25-100	NV	Method 2540 D
7	Biochemical Oxygen Demand (BOD)5	mg/l	2.60	1.0-10	NV	Method 5210 B
8	Chemical Oxygen Demand (COD)Mn	mg/l	4.96	8.0 (MRC)	NV	Method JIS K 0102
9	Ammonium (NH4)	mg/l	0.21	NV	0.1	Method ICs 90
10	Nitrite (NO2)	mg/l	ND	NV	0.1	Method 4500-NO2 C
11	Nitrate (NO3)	mg/l	0.21	NV	0.1	Method 4500-NO3 C
12	Sulfate (SO4)	mg/l	0.46	NV	0.1	Method 4500-SO4 <sup>2-</sup> B
13	Total Coli form	MPN/100ml	1.2x10 <sup>4</sup>	5000	0	Method NF T90-413

សំគាល់: 1- ការវាយតម្លៃការបំពុល និងការដឹកជញ្ជូនសំណាកទឹកមកមន្ទីរពិសោធន៍ក្រុមហ៊ុន (តំបន់) អនុវត្តដោយខ្លួនឯង។  
2- Standards កំរិតកំណត់ស្តង់ដារគុណភាពទឹកនៅតាមតំបន់ទឹកសាធារណៈសំរាប់អភិរក្សជីវៈនៅក្នុងទឹក និងសំរាប់ការការពារសុខភាពសាធារណៈ។  
3- LDL mean Lowest Detection Limit, ND Mean Not Detected (Lower than LDL), NV Mean No Value.

ចេញអោយនៅ ថ្ងៃទី ០៩ ខែ កក្កដា ឆ្នាំ២០១៥

បានឃើញនៅ ថ្ងៃទី ០៩ ខែ កក្កដា ឆ្នាំ២០១៥

ប្រធាននាយកដ្ឋាន  
Was seen on date:  
Director Department  
  
  
**ហេង-ណារ៉េង**

ប្រធានការិយាល័យ

Date of Issue:  
Laboratory Chief

**សេក ឌី**

លេខ ៤៨ ក្រវីថី ព្រះសីហនុ ទន្លេបាសាក់ ខណ្ឌចំការមន ភ្នំពេញ ទូរស័ព្ទលេខ: ០២៣ ២១០ ៤៩២

## Annex B – List of fauna found by local people

Table 1: Bird species

No.	Khmer name	English name	Scientific name
1	Chab don ta	Oriental reed warbler	<i>Acrocephalus orientalis</i>
2	Chab srok	Plain-backed sparrow	<i>Passer flaveolus</i>
3	Chab pouk troung loeung	Asian golden weaver	<i>Ploceus hypoxanthus</i>
4	Chab pouk troung thnoat	Streaked weaver	<i>Ploceus manyar</i>
5	Chab pouk troung thnoat liet	Baya weaver	<i>Ploceus philippinus</i>
6	Chab teit	Common tailorbird	<i>Orthotomus sutorius</i>
7	Khlaeng srak	Barn owl	<i>Tyto alba</i>
8	Kroling kroloung	Black-collared starling	<i>Sturnus nigricollis</i>
9	Kruoch eut	Barred buttonquail	<i>Turnix suscitator</i>
10	Lo lok bai	Spotted dove	<i>Streptopelia tranquebarica</i>
11	Lo lok bai thnoat	Oriental turtle dove	<i>Streptopelia orientalis</i>
12	Lo lok khmoach	Emerald dove	<i>Chalcophaps indica</i>
13	Po pich kbal khmao	Black-headed bulbul	<i>Pycnonotus atriceps</i>
14	Po pich kbal khmao knong sar	Sooty-headed bulbul	<i>Pycnonotus aurigaster</i>
15	Po pich khmao	Black drongo	<i>Hypsipetes leucocephalus</i>
16	Po pich puk moit loeung	Stripe-throated bulbul	<i>Pycnonotus finlaysoni</i>
17	Po pich trachiek chhnot	Streak-eared bulbul	<i>Pycnonotus blanfordi</i>
18	Po pich trachiek krahorm-sar	Red-whiskered bulbul	<i>Pycnonotus jocosus</i>
19	Sarika keo	Common myna	<i>Acridotheres tristis</i>

Source: Interviews with local people.

Table 2: Amphibians and reptiles

No.	Khmer name	English name	Scientific name
<b>I. Amphibians</b>			
1	Kingkuok	Common Asian toad	<i>Bufo melanostriatus</i>
2	Hing	Common Asian bullfrog	<i>Kaloula pulchra</i>
3	Kangkeb	Regulose bullfrog	<i>Hoblobatrachus rugulosus</i>
4	Kanhchanhchek	Common tree frog	<i>Polypedates leucomystax</i>
<b>II. Reptiles</b>			
1	Banguoy thamda		
2	Banguoy slab		
3	Banguoy snaeng		
4	Puos prey	Common rat snake	<i>Ptyas mucosus</i>
5	Puos vek (Sra ngae)	Indochinese spitting cobra	<i>Naja siamensis</i>
6	Puos khiev		

Source: Interviews with local people.

Table 3: Fish species

No.	Khmer name	English name	Scientific name
1	Trey slat	Giant featherback	<i>Chitala lopis</i>
2	Trey chang va	Barilius nanensis	<i>Opsarius koratensis</i>
3	Trey chang va phleang	Esomus goddardi	<i>Esomus longimanus</i>
4	Trey chang va moul	Pale rasbora	<i>Rasbora aurotaenia</i>
5	Trey chang va chhnot	Sidestripe rasbora	<i>Rasbora paviei</i>
6	Trey chhpink prak	Tawes	<i>Barbodes gonionotus</i>
7	Trey chhpink		<i>Hypsibarbus lagleri</i>
8	Trey chrakaing		<i>Scaphognathops stejneri</i>
9	Trey angkat prak	Swamp barb	<i>Systemus aurotaeniatus</i>
10	Trey proloung	Mad barb	<i>Leptobarbus hoeveni</i>
11	Trey riel tob	Siamese mud carp	<i>Henicorhynchus siamensis</i>
12	Trey riel ang kam	Cirrhinus lineatus	<i>Henicorhynchus cruptopongon</i>
13	Trey lenh		<i>Thynnichthys thynnoides</i>
14	Trey damrey	Marbled sleeper	<i>Oxyeleotris marmorata</i>
15	Trey kanh chos thma	Asian bumblebee catfish	<i>Mystus nemurus</i>
16	Trey kanh chos		<i>Mystus wolffi</i>
17	Trey kanh chos chnaut		<i>Mystus atrifasciatus</i>
18	Trey chhlang		<i>Mystus nemurus</i>
19	Trey ta aon		<i>Ompok hypophthalmus</i>
20	Trey andeng roeung	Walking catfish	<i>Clarias batrachus</i>
21	Trey andeng tun	Broad heat catfish	<i>Clarias macrocephalus</i>
22	Trey klang hay		<i>Belodontichthys dinema</i>
23	Trey chhdor	Giant snakehead	<i>Channa micropeltes</i>
24	Trey kranh		<i>Anabas testudineus</i>
25	Trey kampot	Redeye puffer	<i>Carinotetraodon lorteti</i>
26	Trey ptoung		<i>Xenentodon cancila</i>
27	Antuong	Swamp eel	<i>Monopterus albus</i>
28	Trey kcheung	Zig-zag eel	<i>Mastacembelus armatus</i>
29	Trey chhlonh	Peacock eel	<i>Macrogathus siamensis</i>
30	Trey kantrorng preng	Duskyfin glassy percleet	<i>Parambassis wolffi</i>
31	Trey kanhchanh chras tauch	Siamese glassfish	<i>Pseudambassis notatus</i>
32	Trey kam pleanh plouk	Moon light gourami	<i>Trichogaster microlepis</i>
33	Trey kam pleanh samrae	Threespot gourami	<i>Trichogaster trichopterus</i>
34	Trey kanthor	Snakeskin gourami	<i>Trichogaster pectoralis</i>
35	Trey phtuok/Ross	Chevron snakehead	<i>Channa striata</i>

Source: Interviews with local people.

## Annex C – Cambodia’s Protected Areas

Table 4: Protected areas

Protected area	Area (ha)	Province
<b>Natural parks: 871,250 ha</b>		
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
<b>Wildlife preserves: 2,030,000 ha</b>		
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
<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, 1993 on the creation and designation of protected areas.

## Annex D – Public Consultation Participation

List of participants interviewed during IEE consultation activities

No	Name	Position	Organization	Phone no.
1	Mrs. Kem Sokuntheary	Vice Director	PDWT	092 818 017
2	Mr. Nou Chharvivann	Chief of WWTP Office	PDWT	017 260 560
3	Mrs. Sok Kina	Office Chief	Municipality	012 479 030
4	Mr. Rith Seyha	Office Chief	PDoE	012 668 110
5	Mr. Iv Kosal	Director	PDoP	012 773 989
6	Mrs. Chea Soban	Vice Director	PDoT	092 165 099
7	Mr. Hum Bunla	Sangkat clerk	Svay Pao Sangkat	017 945 662
8	Mrs. Mom Vy	Street vendor	-	-
9	Mrs. You Kunthea	Street vendor	-	0977 788 599



## Annex E – Photo pages for the Project



Figure 1: (i) View from the northern side of the Project area; (ii) library; (iii) and (iv) partial views from the northern side of the Project area; and (v) and (vi) partial views from the southern side of the Project area.



## Annex E – Photo pages for the Project (cont.)



Figure 2: Clockwise from top-left: (i) Downstream water sampling in the Project area; (ii) Upstream water sampling in the Project area; and (iii) and (iv) air quality testing in the Project area.



## Annex E – Photo pages for the Project (finished)



Figure 3: Stakeholder meetings. Clockwise from top-left: (i) Consultation with PDWT; (ii) consultation with the Municipality; (iii) consultation with PDoE; (iv) consultation with PDoP; (v) consultation with PDoT; and (vi) consultation with Svay Pao Sangkat.



## **Annex F – Screening for Environmental Impacts**

# Rapid Environmental Assessment (REA) Checklist

## Instructions:

- (i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES) for endorsement by the Director, RSES and for approval by the Chief Compliance Officer.
- (ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.
- (iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

**Country/Project Title:**

CAMBODIA/GMS Livelihood Support for Corridor Towns, Battambang Night Market

**Sector Division:**

Urban Infrastructure Development

Screening Questions	Yes	No	Remarks
<b>A. PROJECT SITING</b> IS THE PROJECT AREA...			
▪ DENSELY POPULATED?		✓	The proposed project area is just close to densely populated areas.
▪ HEAVY WITH DEVELOPMENT ACTIVITIES?		✓	It is a public park including the library which is the provincial library where people can read materials and relax during their free times.
▪ ADJACENT TO OR WITHIN ANY ENVIRONMENTALLY SENSITIVE AREAS?			
• CULTURAL HERITAGE SITE		✓	
• PROTECTED AREA		✓	

Screening Questions	Yes	No	Remarks
• WETLAND		✓	
• MANGROVE		✓	
• ESTUARINE		✓	
• BUFFER ZONE OF PROTECTED AREA		✓	
• SPECIAL AREA FOR PROTECTING BIODIVERSITY		✓	
• BAY		✓	
<b>B. POTENTIAL ENVIRONMENTAL IMPACTS WILL THE PROJECT CAUSE...</b>			
▪ impacts on the sustainability of associated sanitation and solid waste disposal systems and their interactions with other urban services.	✓		Inadequate management of solid waste and aggregates during construction will result in these clogging nearest existing urban drains.  Mitigating measures have been included in the IEE/EMP.
▪ deterioration of surrounding environmental conditions due to rapid urban population growth, commercial and industrial activity, and increased waste generation to the point that both manmade and natural systems are overloaded and the capacities to manage these systems are overwhelmed?		✓	Battambang Municipality will continue to grow at its current or projected rate even without the development project.
▪ degradation of land and ecosystems (e.g. loss of wetlands and wild lands, coastal zones, watersheds and forests)?		✓	
▪ dislocation or involuntary resettlement of people?		✓	
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable group?		✓	
▪ degradation of cultural property, and loss of cultural heritage and tourism revenues?		✓	
▪ occupation of low-lying lands, floodplains and steep hillsides by squatters and low-income groups, and their exposure to increased health hazards and risks due to pollutive industries?		✓	

Screening Questions	Yes	No	Remarks
▪ water resource problems (e.g. depletion/degradation of available water supply, deterioration for surface and ground water quality , and pollution of receiving waters?			About 30 meters at the eastern part of the project is the Sangke River. However, minor deterioration of Sangke water resource may probably occur due to inadequate management of solid waste and aggregates during construction. Mitigating measures have been included in the IEE/EMP.
▪ air pollution due to urban emissions?		✓	No air polluton is expected from the development project.
▪ risks and vulnerabilities related to occupational health and safety due to physical, chemical and biological hazards during project construction and operation?		✓	The project will not provide any risks and vulnerabilities related to occupational health and safety due to physical, chemical and biological hazards during project construction and operation. Mitigating measures have been included in the IEE/EMP.
▪ road blocking and temporary flooding due to land excavation during rainy season?	✓		Road blocking during the project construction is expected. However, this is just temporary and short period of time. Mitigating measures have been included in the IEE/EMP.
▪ noise and dust from construction activities?	✓		Dust/suspended particles and noise will be generated from construction activities. They will be more salient during the construction period. These impacts will be temporary but, if not mitigated, will have potentials to result in long-term consequences in the health of the nearby households and the construction workers. Mitigating measures have been included in the IEE/EMP.
▪ traffic disturbances due to construction material transport and wastes?	✓		Traffic disturbances due to construction, material transport and wastes is expected but it is just temporary and short period of time. Mitigating measures have been included in the IEE/EMP.
▪ temporary silt runoff due to construction?		✓	
▪ hazards to public health due to ambient, household and occupational pollution, thermal inversion, and smog formation?		✓	
▪ water depletion and/or degradation?	✓		Minor deterioration of Sangke water resource may probably occur due to inadequate management of solid waste and aggregates during construction. Mitigating measures have been included in the IEE/EMP.
▪ overpaying of ground water, leading to land subsidence, lowered ground water table, and salinization?		✓	No ground water is used for the project construction.

Screening Questions	Yes	No	Remarks
<ul style="list-style-type: none"> <li>contamination of surface and ground waters due to improper waste disposal?</li> </ul>	✓		Minor contamination of Sangke water surface may probably occur due to inadequate management of solid waste and aggregates during construction. Mitigating measures have been included in the IEE/EMP.
<ul style="list-style-type: none"> <li>pollution of receiving waters resulting in amenity losses, fisheries and marine resource depletion, and health problems?</li> </ul>		✓	
<ul style="list-style-type: none"> <li>large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?</li> </ul>		✓	There might have minor population influx not during the project construction but operation period. However, this might not put a burden on social infrastructure and services.
<ul style="list-style-type: none"> <li>social conflicts if workers from other regions or countries are hired?</li> </ul>		✓	Priority in labour employment will be provided to local residents while outsiders will be considered in case of lack in labour.
<ul style="list-style-type: none"> <li>risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during operation and construction?</li> </ul>		✓	No transport, storage, and use and/or disposal of hazardous materials such as explosives, and other chemicals during construction and operation is expected.
<ul style="list-style-type: none"> <li>community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?</li> </ul>		✓	Working conditions at construction site will be secured. Only workers and project staff will be allowed to enter the construction and operation sites. Mitigating measures have been included in the IEE/EMP.

## Annex G – Environmental Mitigation Plan

Project phase	Project activity	Potential environmental impacts	Proposed mitigation measures	Location	Estimated cost	Institutional responsibilities	
						Implement	Supervise
Pre-construction	Detailed design	1. Ineffectiveness of service of completed works due to inadequate consideration during design of (any one or combination of) the following: - Climate change; - Vulnerability to other natural hazards; - Relevant feedback from stakeholders.	1.1 Design to incorporate relevant issues, concerns, and experience of local stakeholders pertaining to the Project area's coping with climate change events, as raised during consultations.	Not applicable	c/o design cost	Design consultant	PMU/PIU/ESO/ADB*
		2. Damage to existing structures	2.1 The design should maximize benefits or avoid/minimize impacts on assets.	Not applicable	c/o design cost	Design consultant	PMU/PIU/ESO/ADB*
	Obtaining approval	3. Overall environmental concerns/impacts of the Project.	3.1 Obtain IEE approval for the Project.	Not applicable	c/o PMU's counterpart budget	PMU	PMU/PIU/ESO/ADB*
		4. Engagement of environmentally-irresponsible contractors for civil works.	4.1 A SPS-compliant EMP, as part of bidding documents. 4.2 EMP to be appended to the contract for basis for compliance. 4.3 Contract to require contractor's submission of monthly EMR.	Not applicable	-	PMU	PMU/PIU/ESO/ADB*
		5. UXO "chance find"	5.1 Workers' pre-orientation training to include procedures to follow in case of UXO "chance find". First-response team to coordinate and undergo orientation on management of UXO "chance find" event.	In construction site	c/o construction mobilization cost (preliminaries)	Contractor	PMU/PIU/ESO/ADB*
Construction	Earthworks, site clearing, hauling of construction materials	Physical/chemical environment 6. Dust/suspended particles generation from - Earthworks - Stockpile of fine aggregates, sand, cement - Transport of aggregates, cement for disposal, and	6.1 Strictly implement dust control measures such as periodical water spray. 6.2 The contractor shall maintain construction equipments in adequate working condition. 6.3 The driver of construction vehicles must comply with speed	In construction site	c/o construction running, set up costs (preliminaries)	Contractor	PMU/PIU/ESO/ADB*

Project phase	Project activity	Potential environmental impacts	Proposed mitigation measures	Location	Estimated cost	Institutional responsibilities	
						Implement	Supervise
		wastes - Movements of construction vehicles/equipment	6.4 limits to minimize road dust. Prepare and strictly implement a traffic management plan around construction site.				
		7. Noise and vibration	7.1 Construction works with heavy noise and vibration shall be prohibited during the night (09:00 pm–6:00 am) to avoid noise disturbance in surrounding areas. 7.2 Select quiet equipment and working methods as much as possible. 7.3 Provide prior notification to the local community on schedule of construction activities.	In construction site	c/o construction mobilization cost (preliminaries)	Contractor	PMU/PIU/ESO/ ADB*
		8. Water pollution	8.1 Strictly control waste oil and other waste. 8.2 The contractor will be prohibited from washing construction tools along the river to prevent further pollution. 8.3 The wastewater septic tank facility in the workers' camp and/or other necessary locations shall be properly maintained.	In construction site	c/o construction mobilization cost (preliminaries)	Contractor	PMU/PIU/ESO/ ADB*
		9. Soil pollution	9.1 Diesel and waste oil shall be handled and stored carefully to prevent leakages or spills. Waste oil shall be collected and stored in drums, and disposed of at a site approved by the local authority, and raised off the ground, and covered to keep rain out and surrounded by a bund to contain spills and simplify clean up operations.	In construction site	c/o construction mobilization cost (preliminaries)	Contractor	PMU/PIU/ESO/ ADB*
		10. Waste	10.1 Prepare and strictly implement a proper waste management plan. 10.2 The waste management plan should be approved by the local authority in advance of construction works. 10.3 The contractor shall provide temporary sanitation facilities	In construction site	c/o construction mobilization cost (preliminaries)	Contractor	PMU/PIU/ESO/ ADB*

Project phase	Project activity	Potential environmental impacts	Proposed mitigation measures	Location	Estimated cost	Institutional responsibilities	
						Implement	Supervise
			such as portable toilets and garbage bins to ensure that domestic wastes generated by construction personnel are well managed. 10.4 Office building for the contractor shall be provided with toilets and septic tanks to handle domestic sewage.				
		11. Accidents of construction workers	11.1 The contractor shall comply with the implementation plan and secure working conditions.	In construction site	c/o onstruction mobilization cost (preliminaries)	Contractor	PMU/PIU/ESO/ADB*
Operation	Daily operation	12. Solid waste	12.1 Prepare and strictly implement a proper waste management plan. 12.2 The waste management plan should be approved by the local authority in advance of market operation.	The market site	-	Operator	PMU/PIU/ESO/ADB*
		13. Noise	13.1 Market operations will generate noise. Noise level monitoring should be conducted to meet national standards. 13.2 In case the noise level is much higher than the standard limit, find ways in consultation with relevant stakeholders to minimize such issues.	The market site	-	Operator	PMU/PIU/ESO/ADB*



## Annex H – Environmental Monitoring Plan

Aspects/parameters to be monitored	Location	Means of monitoring	Frequency	Estimated cost (USD)	Institutional responsibilities	
					Implementation	Compliance monitoring
Environmental monitoring						
<b>A. Pre-construction phase</b> During procurement prior to awarding of contract for civil works <b>1. <u>Ambient air quality</u></b> CO, SO <sub>2</sub> , NO <sub>2</sub> , TSP	In the project area	Analytical methods applied by the MoE	Once	1,200.00	Licensed lab (for PMU)	ESO/ADB*
<b>2. <u>Ambient noise levels</u></b> <b>L<sub>max</sub>, L<sub>min</sub>, Leg</b>	In the project area	Analytical methods applied by the MoE	Once	150.00		
<b>3. <u>Surface water quality</u></b> pH, turbidity, TDS, DO, TSS, BOD, COD, NH <sub>4</sub> , NO <sub>2</sub> , NO <sub>3</sub> , SO <sub>4</sub> , and total coliform	1 upstream and 1 downstream of the Sangke River	Analytical methods applied by the MoE	Once	420.00		
Sub-total (pre-construction for baseline data)				<b>1,770.00</b>	-	-
<b>B. Construction phase</b> <b>1. <u>Ambient air quality</u></b> CO, SO <sub>2</sub> , NO <sub>2</sub> , TSP	In the project area	Analytical methods applied by the MoE	Once	1,200.00	Licensed lab (for PMU)	ESO/ADB*
<b>2. <u>Ambient noise levels</u></b> <b>L<sub>max</sub>, L<sub>min</sub>, Leg</b>	In the project area	Analytical methods applied by the MoE	Once	150.00		
<b>3. <u>Surface water quality</u></b> pH, turbidity, TDS, DO, TSS, BOD, COD, NH <sub>4</sub> , NO <sub>2</sub> , NO <sub>3</sub> , SO <sub>4</sub> , andTotal coliform	1 upstream and 1 downstream of the Sangke River	Analytical methods applied by the MoE	Once	420.00		
Sub-total (during construction)				<b>1,770.00</b>	-	-
<b>TOTAL</b>				<b>3,540</b>	-	-