Initial Environmental Impact Assessment

27 December 2016

CAM: GMS Tourism Infrastructure for Inclusive Growth Project

Loan 3194-CAM

Prepared by the Ministry of Tourism, Cambodia for the Asian Development Bank.

MINISTRY OF TOURISM

KINGDOM OF CAMBODIA
NATION RELIGION KING

ASIAN DEVELOPMENT BANK

MINISTRY OF TOURISM

INTERNATIONAL STANDARD COORDINATION UNIT

GREATER MEKONG SUBREGION TOURISM INFRASTRUCTURE FOR INCLUSIVE GROWTH

ADB LOAN No. 3194-CAM (SF)

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VICA in Joint Venture with SBK

Executing Agency:	Funding Agency:	VICA Consultants:
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ABBREVIATIONS

ABR	-	Anaerobic Baffle Reactor
ADB	-	Asian Development Bank
DAFF	-	Department of Agriculture, Forestry and Fisheries
DOE	-	Department of Environment
DPWT	-	Department of Public Works and Transport
DOT	-	Department of Tourism
DOWRAM	-	Department of Water Resources and Meteorology
EA	-	Executing agency
EIA	-	Environmental impact assessment
EMP	-	Environment management plan
GMS	-	Greater Mekong Subregion
Government	-	Government of Cambodia
IEE	-	Initial environment examination
IEIA	-	Initial environmental impact assessment
MAFF	-	Ministry of Agriculture, Forestry and Fisheries
MOE	-	Ministry of Environment
MIME	-	Ministry of Industry, Mines and Energy
MPWT	-	Ministry of Public Works and Transport
MOT	-	Ministry of Tourism
MOWRAM	-	Ministry of Water Resources and Meteorology
PAM	-	Project administration manual
PISC	-	Project implementation and supervision consultant
PIU	-	Project implementation unit
PPCC	-	Provincial project coordination committee
PPTA	-	Project preparatory technical assistance
PPMU	-	Provincial project management unit
REA	-	Rapid environmental assessment
RP	-	Resettlement plan
RGC	-	Royal Government of Cambodia
SPS	-	Safeguard policy statement (2009)
WWTP	-	Wastewater treatment plant

WEIGHTS AND MEASURES

km	-	kilometer
kg	-	kilogram
ha	-	hectare

CURRENCY EQUIVALENTS
(22 August 2016)

Currency Unit	-	Riel R
R1.00	=	$0.000244
$1.00	=	R4,095

In this report, "$" refers to US dollars.

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EXECUTIVE SUMMARY

The provinces of Kampot and Kep, are the locations of the subprojects of the Greater Mekong Subregion (GMS) Tourism Infrastructure for Inclusive Growth Project (the project) in Cambodia. Cambodia, together with the Lao PDR and Viet Nam are the three countries that form the project. The provincial subprojects are comprised of small infrastructure and environmental improvement investments that have the inclusive goal of increasing and improving tourism and associated socioeconomic development at selected locations. The development of tourism to enhance pro-poor employment is consistent with the GMS Strategic Framework 2012-2022, GMS Tourism Sector Strategy 2005-2015, and the current poverty reduction strategies of the participating countries.

The initial environmental impact assessment (IEIA) of the project presented herein addresses infrastructure subprojects in Kampot and Kep, Cambodia. The IEIAs of the provincial subprojects in Viet Nam and the Lao PDR have been prepared separately.

Project Summary

The project in Cambodia is categorized as under ADB Category B at the feasibility design phase and includes the following infrastructure subprojects under Outputs 1 and 2 of the project. Outputs 3 and 4 support capacity building and project management are not addressed by the IEIA:

Output 1: Last Mile Tourism Access Infrastructure Improved

Kampot Pier Development:

¿ New passenger pier and associated tourist support facilities including an upgraded access road.

Output 2: Environmental Services in Cross Border Tourism Centers Improved

Kep Crab Market Environmental Improvements:

¿ Crab market environmental improvements including a centralized wastewater collection and treatment system;

The passenger pier and support facilities will be located on the Teuk Chhou River south of Kampot town near the mouth of the river at Kampong Bay. Support facilities for the pier will include customs/immigration buildings, tourist information building and kiosks, car park, lighting, and public toilets. The goal of the subproject is to provide new tourism access to southern Kampot and the Cambodian coastal zone. The new pier may also be used by existing mini-cargo boats that are currently using a small port up-river near Kampot town. An interpretive mangrove demonstration area will be established in the middle of the pier facility to provide information and create awareness of the ecological importance of the country's extensive mangrove forests among tourists that will soon use the said gateway.

The new passenger pier is expected to provide visitors and foreign tourists in the region with additional scenic destinations and fast sea travel between Cambodia and Kieng Giang, Viet Nam. The existing access road to the pier area from Kampot town will be upgraded to facilitate easy travel of tourists entering the area through the new passenger pier.

The crab market is one of the selling points of tourism in Kep. Environmental improvements in the crab market area will include: 1) construction of centralized wastewater collection with an

Anaerobic Baffle Reactor (ABR) treatment system; 2) upgraded car park; 3) additional public toilets; 4) improved solid waste management in the market area; 5) upgraded power supply, thus providing better lighting system to the market area; and 6) new signage.

Potential Impacts

The examination of the subprojects in Cambodia indicates that potential environmental impacts are largely restricted to the construction phase of the subproject components. The construction-related disturbances, such as noise, dust, erosion, sedimentation, solid and liquid waste pollution, increased traffic and risk of worker and public injury can be managed with standard construction practices and guidelines (e.g., World Bank 2007). But even noise pollution and traffic risk and inconvenience are not that significant in the case of the Kampot pier construction as it is far away from the population center.

Stakeholder consultations including household and village-level interviews underscored the need for effective management of noise, dust, traffic disruptions, and safety during the construction phase of the project. Follow-up meetings with the consulted stakeholders in particular the inter-agency local authorities, to address any construction-related issues are required.

The operation of the new passenger pier in Kampot could negatively affect the sensitive coastal resources and critical habitat in Kampong Bay as a result of the increased waterway traffic and boat-related pollution in the area. The critical habitats that are exposed to the said traffic are the offshore seagrass beds and adjacent mangrove forests. These near shore critical habitats support well known rare and endangered species, such as the marine mammal Dugong ssp, sea turtles, diverse species of fish and crustaceans, as well as, the inshore and offshore fisheries.

It is strongly recommended that a navigation management plan and restriction measures are developed for the Teuk Chhou River and near shore Kampong Bay to address the anticipated increase in waterway traffic in the vicinity of the new passenger pier. The navigation plan, among other concerns, should specify maximum number of boats that will operate on the waterway and length and frequency of travel, establish an arbitrary channels and lanes for different boat types, and demarcate the seagrass conservation areas, and mangrove areas which must not be traversed by boat.

A potentially significant issue in the operation of the ABR septic system at the crab market in Kep may likely arise due to the limited size of the absorption area where treated waste water is going to be drained. If the infiltration site is too small, unassimilated wastewater could leak laterally to the shoreline, thereby decreasing coastal water quality. Also, it may affect the groundwater and local domestic wells. One option would be to increase the size of the reclamation area at the northern side of the market which is intended for the ABR location. Likewise, if the quality of the treated waste water being discharged meets the standard threshold value of the water body where it is being drained, there will be no adverse consequence expected. Thus, the detailed design of the subproject should take into consideration the land area requirements, as well as the soil type and permeability of the infiltration site, but most of all, the elevation or location. Further, the treated waste water should meet the standard quality requirement of a given classification of water body where it is being drained, or else it should be diverted and re-used for added value.

Available data and information indicate the absence of a terrestrial critical wildlife habitat, rare or endangered species. Likewise, there are no special ecological attributes of the protected areas,

as well as unique cultural significance and values at the subproject sites that are worth protecting and conserving. However, a re-examination of the ecological and cultural values of the sites should be done during the detailed design stage, especially the coastal ecosystem and the immediate environment. This is to ascertain that there will be no potential adverse impacts of the proposed infrastructures that will occur during the construction and operation phases. It is recommended that as part of the EMP's updating process, supplementary data/information should be gathered if necessary. However, in the absence of new data, the best professional judgment should be sought to address or resolve any probable unforeseen negative impacts that are not indicated in this IEIA.

Potential induced impacts of the subprojects resulting from increased tourism activities in both Kampot and Kep may arise due to continuous site improvements. An example in Kep is the likelihood of increased pollution, resulting from massive solid and domestic wastes accumulation outside the subproject sites due to the growing influx of tourists to the area. With more tourists coming, the greater the food and material resource consumption would be. This will result to a big pressure on solid wastes management, thus, affecting the cleanliness and sanitation of the immediate beaches, parks and promenades.

Another potentially induced impact of increased tourism development would be the sporadic uncontrolled commercial and urban expansion that can occur in response to the growing tourism industry in the area as long-term impact of the subprojects. The passenger pier in Kampot for example offers greater and possibly unregulated growth in both tourism and urban development along the coastline and interior of Kampot. Indirect induced tourism-socioeconomic progress is usually broader geographically and more difficult to manage with respect to impacts on environmental resources because of the different competing parties and interests groups involved with higher bids for control over the limited tourism space in the area.

Conclusions

The IEIA concludes that the subprojects' proposed design description in Kampot and Kep, combined with the available information on the affected environments is sufficient basis to determine the type and scope of potential environmental impacts of the planned interventions. Further, the identified environmental impacts during the construction and operational phases are considered normal and negligible. They can easily be mitigated by proper management, and most importantly, does not entail significant design adjustment of one or more of the subproject components. Thus, the subprojects do not require full environmental impact assessment (EIA)

Sea level rise and the probable occurrence of storm surge on the coastal fronts of Kampot and Kep in the distant future may require appropriate designing and quality material for the pier foundation. Likewise, the prospect of recycling treated waste water from both Kampot pier and Kep crab market as value added uses (e.g., construction of artificial wetlands and for irrigation, in Kampot, etc.,) should be explored. The aim is to reduce the incidence of water table contamination and sea water pollution as a result of discharging the treated waste water to the ground or directly to the sea.

The separate EMPs developed for the two subprojects provide impacts mitigation plans, environmental monitoring plans. It also specifies the institutional responsibilities and capacity needs for the environmental management of the subprojects. The IEIA recommends that the EMPs be reviewed and updated during the detailed design phase in order to ensure that they will fully address any potential impacts of the final subproject designs and operations.

I. INTRODUCTION

A. Background to IEIA

1. The Greater Mekong Subregion (GMS) Tourism Infrastructure for Inclusive Growth Project (the project) is a multi-sector tourism investment project in Cambodia, the Lao PDR, and Viet Nam. The project is comprised of transport-related and environmental infrastructure subprojects and activities in twelve provinces of the three participating countries.

2. The objective of the project is to accelerate inclusive tourism growth in the targeted areas of the GMS. Inclusive growth is defined by local social and economic growth from tourism development that is environmentally sustainable. The development of tourism to enhance pro-poor employment is consistent with the GMS Strategic Framework 2012¯2022, GMS Tourism Sector Strategy 2005¯2015, and the current poverty reduction strategies of the participating countries. The GMS Tourism Sector Assessment, Strategy, and Roadmap indicate that ADB's assistance to the tourism sector will focus on:

    1) Improving last-mile tourism access infrastructure and environmental services in secondary destinations;
    2) Capacity building for public officials and local communities; and
    3) Promoting multi country tour circuits.

3. The project is included in the participating countries ADB Country Partnership Strategies which emphasize the need to improve rural transport infrastructure, expand municipal infrastructure and services, and promote small and medium-sized enterprises to boost the poor's access to economic opportunities. The project has four outputs as follows:

    Output 1: Last Mile Tourism Access Infrastructure Improved which includes new and upgraded roads, passenger piers, and new and improved tourism support facilities;
    Output 2: Environmental Services in Cross Border Tourism Centers Improved which includes improved wastewater and solid waste management systems;
    Output 3: Institutional Capacity to Promote Inclusive Tourism Growth Strengthened; and
    Output 4: Effective Project Implementation and Knowledge Management.

4. Output 1 and Output 2 are derived from the infrastructure investments, whereas Outputs 3 and 4 comprise `softer_ tourism development initiatives such as tourism planning and management, development of public-private partnerships, and counterpart capacity building and training in tourism. The two subprojects in the provinces of Kampot and Kep (Table 1) are the focus of the IEIA presented herein (Figure 1).

Figure 1: Project Provinces in Cambodia

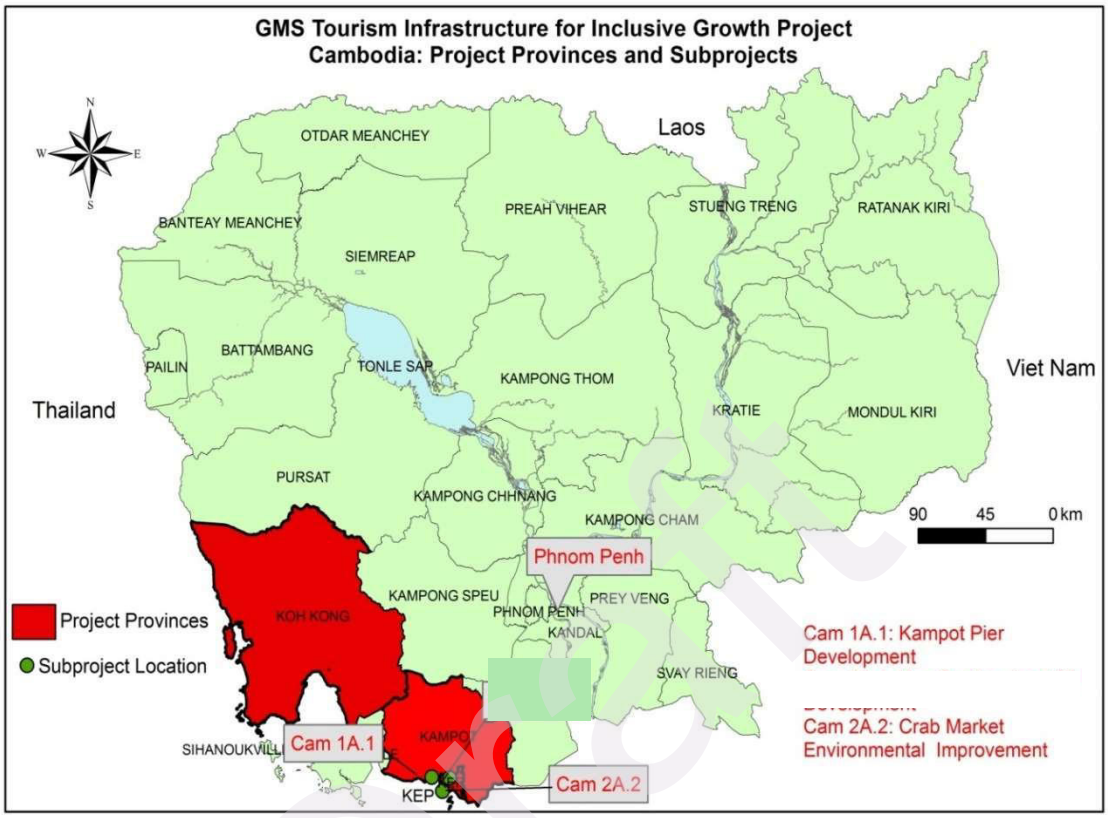


Table 1: Summary of Output 1 and 2 Activities in Kampot and Kep

Output 1: Last Mile Tourism Access Infrastructure Improved
Kampot Pier Development: ¿ New passenger pier and associated tourist support facilities including upgraded access road.
Output 2: Environmental Services in Cross Border Tourism Centers Improved
Kep Crab Market Environmental Improvements: ¿ Crab market environmental improvements including a new wastewater collection and treatment system

B. Assessment Context

5. The project is categorized Category B pursuant to the ADB's safeguard policy[1] and recent good practice sourcebook guidance.[2] A category B project will have potential adverse impacts that are less adverse than those of a category A project, are site-specific, largely reversible, and can be mitigated with an environmental management plan.[3]The government of Cambodia (Government) requires that a Cambodian environmental impact assessment (EIA) (see below) be conducted for both subprojects.

[1]ADB, 2009. Safeguard Policy Statement. Manila
[2]ADB, 2012, Environmental Safeguards, A Good Practice Sourcebook, Draft. Manila.
[3]Footnote 2, pg 19.

6. The IEIA was prepared for the feasibility design stage of the Cambodian subprojects using available data and information on sensitive ecological and cultural receptors that exist near the different subproject sites. Detailed designs for the subprojects will follow project approval. Environmental management plans (EMP) have been prepared for the subprojects in Kampot and Kep which will be updated where necessary to meet the completed detailed designs of the subprojects.

7. The subproject area of Kampot province is delimited by the coastal zone of Kampong bay, the mouth of the Teuk Chhou River, and southern peri-urban area of Kampot town along the east side of the river. The coastal zone of Kampot is noted for extensive seagrass beds and mangrove forests which support rare and endangered marine animals including the green turtle and sea cow, a marine mammal.[4] The crab market of Kep is situated in the centre of Kep town on the coast just east of Kampot.

1. Impact Footprints

8. The subproject activities in Kep are located in an existing tourist area defined by the crab market which means the potential impacts of the subproject will be marginal to the existing impact footprint of the crab market. Nonetheless, the project will need to ensure that the completed subproject activities do not increase the impact footprint of the crab market area. However, the ABR wastewater treatment system should actually reduce the existing impact footprint of the market by consolidating and treating wastewater that currently is discharged freely throughout the area.

9. The new pier at the mouth of the Teuk Chhou River will result in the addition of tourist waterway congestion to the already busy cargo and fishing boat traffic in the river. As introduced above and elaborated further below, the challenge for the project in Kampot is to not expand the impact footprint of boat activities on the sensitive near shore coastal resources of Kampong bay.

10. This IEIA Document was first prepared by the PPTA Consultants for the ADB in 2013 as part of the Lender's requirement, and was updated by the EA Loan Consultants, namely, Paulo N. Pasicolan and Sethy Sour.

II. POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

A. Environmental Impact Assessment

11. Environmental impact assessment in Cambodia is guided by the Royal Government of Cambodia (RGC) sub-decree on EIA, No 72 ANRK.BK issued on August 11th, 1999, and the Prakas No 376 BRK B.S on September 02nd, 2009, on Guideline of Initial Environmental Impact Assessment (IEIA) and full EIA.

12. In compliance with the sub-decree on EIA, all individuals, private companies, joint-venture companies, public companies, ministries and government agencies are obliged to conduct an environmental impact assessment for proposed projects or activities, which must be submitted for approval by the MOE. The decree provides a list of project types that proponents use to screen projects for requiring either an EIA or Initial EIA

[4] IUCN Red List

(IEIA). From consultations with the MOE and provincial Departments of Environment (DOE), the subprojects in Kep and Kampot will require a Cambodian EIA that will be administered by MOE because of the size of the subprojects, and because the subproject costs exceed $1,000,000. As dictated by No 72 ANRK.BK, the MOE is required to complete their review of a submitted IEIA or EIA within 30 working days to conclude the approval process.

13. The IEIA presented herein exceeds the requirements of Sub-decree No 72 ANRK.BK on EIA. The scope of the assessment of the IEIA required of the ADB SPS (2009) also exceeds the supporting RGC Prakas guideline IEIA/EIA.

B. Legal and Policy Framework for Environmental Protection

10. The Government of Cambodia has established specific laws and regulations for forests, protected areas, and land management to ensure sustainable development. The key elements of the legal and policy framework for the project include the following:

- Law on Environmental Protection and Natural Resources Management, enacted by National Assembly, 1996, promulgated by Preah Reach Kram/NS/RKM-1296/36;
- Law on Natural Protected Areas enacted by National Assembly, 2008, promulgated by Preach Reach Kram/NS/RKM//0208/007;
- Law on Fisheries Management and Administration, 1989.
- Law on Forest, enacted by National Assembly, 2002, promulgated by Preach Reach Kram/NS/RKM/0802/016;
- Law on Land, enacted by National Assembly, 2001, promulgated by Preach Reach Kram/NS/RKM/0801/14; and
- Law on Water Resource Management produced by Ministry of Water Resources and Meteorology (MOWRAM);
- Circular No 01 SRNn issued on February 03rd, 2012, Royal Government of Cambodia on Cambodia Coastal Zone Development.

11. Key directives in support of the Law on Environmental Protection and Natural Resources Management include:

- Law on Natural Protected Areas (2008); and
- Sub-decree on Water Pollution Control (1999):
  - Annex 1: Industrial effluent standards (including WWTPs);
  - Annex 2: Water quality standards for public water and biodiversity; and
  - Annex 3: Water quality standards for public waters and health.

12. Other pertinent regulations, policy, or guidelines for the project are as follows:

- Directive on Industrial Sludge Management (MOE, 2000);
- Directive on Industrial Hazardous Waste Management (MOE, 2000);
- Directive on Managing Health Wastes in the Kingdom of Cambodia (MOH, 2008)
- Preach Reach Kept on Creation of Fisheries Communities (2005); and

¿ Anklets on establishment of protected forests, natural resources conservations, wildlife protection areas, protected forest for biodiversity conservation (2002and 2004).

13. Cambodia is signatory to many international environmental treaties and conventions which provide a comprehensive legal framework related to coastal management. These include: the Coordinating Body of the Seas of East Asia (1995), Association of South East Asian Nations (1999), MARPOL (1994), Biodiversity convention (1994), CITES convention (1997), Ramses convention (1999) and Climate Change convention (1995) (MOE 2006). The closest Ramses site to the subproject areas is more than 100 km away in Koh Kapok, Koh Kong province to the west.

14. The Government standards for industrial effluent discharge, ambient surface and coastal water quality, and public waters and health of Annexes 2 - 5 of the sub-decree on Water Pollution Control (1999) are reproduced in Appendix A.

15. Occupation and Community Safety and Health (OHS) guidelines for Government follow the recent OHS Programme for Cambodia (2010-2013) that was developed by the International Labour Organization (ILO). The draft guidelines provide the framework for instituting OHS at the workplace and in the community.

16. For all other applicable environmental standards and criteria such as ambient air quality, vibration, noise, contaminated soil, and workplace and community safety the standards and protocols of the Environment, Health and Safety Guidelines of the World Bank (2007) will apply.

C. Agencies Responsible for Coastal Zone Management and Assessment

17. At the national level, agencies in Cambodia that oversee environment and natural resources management are listed below. Most of Ministries have provincial counterpart departments.

¿ Ministry of Environment (MOE);
¿ Ministry of Agriculture, Forestry and Fisheries (MAFF);
¿ Ministry of Water Resources and Meteorology (MOWRAM);
¿ Ministry of Land Management; and Urban Planning (MLUP);
¿ Ministry of Tourism (MOT);
¿ Ministry of Mines and Energy (MME);
¿ Ministry of Industry and Handicraft (MIH);
¿ Ministry of Public Works and Transport (MPWT) and a cross-ministerial policy body of National Climate Change Committee (NCCC).

1. Inland Waterways and Maritime Ports Authority

18. The Inland Waterways and Maritime Ports Units the MPWT is responsible for managing river navigation and coastal ports. A Ports Authority to oversee all ports in Cambodia is being considered by the MPWT. Currently, navigation buoy systems are poorly developed in major Cambodian rivers (e.g., Mekong River) and coastal area.

19. Important offices of the MOE for the project include:

- ¿ Coastal Coordination Unit[5] which:
  - o Promotes sustainable development in the coastal zone of Cambodia;
  - o Coordinates with donors, NGOs, and other line ministries with coastal zone developments;[6] and
  - o Provides advice and guidance for environmental protection of the coastal zone resources.
- ¿ Nature Protection and Conservation Administration (NPCA) which, inter alia,
  - o Produces strategic plans and technical guidelines for managing protected areas;
  - o Investigates and polices land use violations in protected areas; and
  - o Disseminates information, and conducts awareness campaigns for the protection of the resources in protected areas.

20. The MAFF is responsible for the management and protection of coastal mangrove forests, and wildlife and fisheries. The Fisheries Administration (FA) at the national and provincial levels is responsible for all fisheries related matters as summarized below:

- ¿ Prepares and establishes fishery resource and aquaculture inventories;
- ¿ Enacts laws, regulations, and orders for fishery protection, management and improvement of fishery resources and habitat;
- ¿ Manages fishery zones, fishery conservation and establish fisheryfi resource development policies;
- ¿ Conducts scientific studies of fisheries and aquaculture; and
- ¿ Inspects and manages fishery resource exploitation and aquaculture activities.

21. The EIA Department of the MOE oversees and regulates EIA, and coordinates the implementation of projects in collaboration with project executive agencies (EA) and concerned ministries. The MOE has the following responsibilities:

1. Reviews, evaluates, and approves submitted environmental impact assessments in collaboration with other concerned ministries; and
2. Monitors to ensure a project owner (the executing agency of the project) satisfactorily implements the Environmental Management Plan (EMP) throughout pre-construction, construction and operational phases of the projects.

22. The ministries are represented and supported at the provincial, town, and district/commune levels by counterpart line departments, agencies, and sub-offices. The counterparts are responsible to extend and implement the mandate of their parent ministries to the commune level.

23. The IEIAprepared for subprojects in Cambodia exceeds or meets the EIA requirements of the MOE. The IEIA will provide guidance to the national consultants who will prepare the EIA if required by the MOE during project implementation.

[5] Rizvi,A.R.and Singer,U. (2011). Cambodia Coastal Situation Analysis, Gland, Switzerland: IUCN. 58 pp.
[6] e.g., MOE and Danida, 2006. Cambodia Shoreline Management Strategy, 97 pgs + appendices

D. ADB Safeguard Policy

24. The ADB safeguard policy statement (ADB 2009) along with the recent Good Practice Safeguard Sourcebook clarify the rationale, scope and content of an environmental assessment and supported by technical guidelines (e.g., Environmental Assessment Guidelines, 2003). Projects are initially screened to determine the level of assessment that is required according to the following three environmental categories (A, B, or C).

25. Category A is assigned to projects that normally cause significant or major environmental impacts that are irreversible, diverse or unprecedented such as hydroelectric dams (an Environmental Impact Assessment is required). Category B projects have potential adverse impacts that are less adverse than those of category A, are site-specific, largely reversible, and for which mitigation measures can be designed more readily than for category A projects (an Initial Environmental Examination 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.

III. DESCRIPTION OF CAMBODIA SUBPROJECTS

26. The subprojects for Output 1 and 2 in Kampot and Kep provinces are described below.

A. A. Output 1: Last Mile Tourism Access Infrastructure Improved

1. Kampot Pier Development

a. Current situation

27. Kampot Province provides one entry point to southern coastal attractions of Cambodia. Kampot town lies approximately 150 km from Phnom Penh and can be accessed by road with relative ease in approximately 3 hours via National Highway 3. Development of a passenger pier south-east of Kampot town will create new multi-modal options for transporting passengers and light freight between Cambodia, Viet Nam, and other international coastal destinations. The pier will also provide a staging point for local excursions.

31. Soil structure at the proposed pier location is loose and a combination of silt and clay (Plate 1). The soil parent material is not of the coralline or limestone rock in origin. Rather, it is alluvium sediment deposit. Hence, the soil foundation is fragile and unstable (Source: Direct examination)

Plate 1: *Soil composition made of clay and alluvial sediment at the proposed pier location*

32. There is a huge grassland area without tree vegetation just within the premise of the proposed pier location in Kampot. These spaces are potential sites for tree parks establishment and greening projects that can provide aesthetics, wind breaks, temperature conditioner and ground cover of the area. (Source: Direct observation)

33. There is a close proximity between the proposed waste water treating facility and the salt farms. The location of the septic tanks and waste water treating unit at the Kampot pier which is just few meters away across the access road to the salt beds may likely permeate the water table, thus, can potentially affect the salt quality being produced in the area.. (Source: Direct observation)

b. Subproject description

34. The Kampot passenger pier will be developed on a vacant 4.0 ha where located at ChumKriel village, ChumKriel commune, Teuk Chhou district, or site on the east bank of the Teuk Chhou River approximately 10 km downstream of Kampot at the discharge of the river to Kampong bay (Figure 2). Vehicular access to the site is via the main Kampot-Kep Highway H123 and then along a well-constructed earth road for about 6 km through low lying salt farms situated along the river. The components of the passenger pier development are summarized in Table 2 with the ground plan shown in Figure 3.

35. In addition to the primary pier facilities listed above a system of navigational aids will be installed to identify the channel from the Teuk Chhou River into Kampong Bay that is used by current cargo and fishing boat traffic. The objective is to distinguish the scoured boat channel from the adjacent environmentally sensitive sea grass beds that exist on both sides of the channel out into Kampong bay. The navigational system will also benefit the objective increase in boat traffic in the area.

Figure 2: Passenger Pier Site and Access Road (red) from Highway to Kampot Town (left)

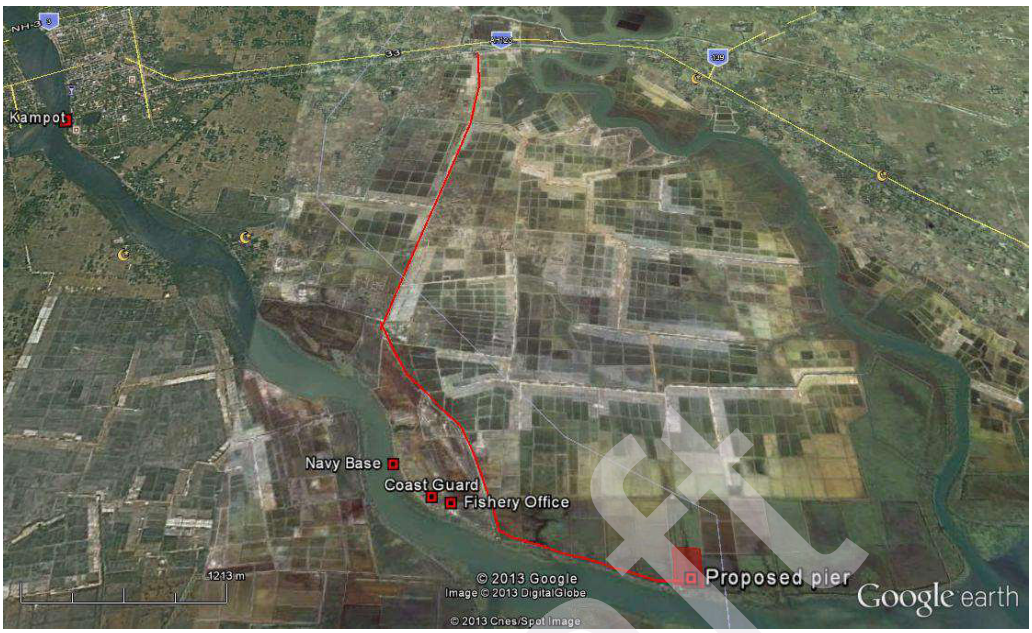
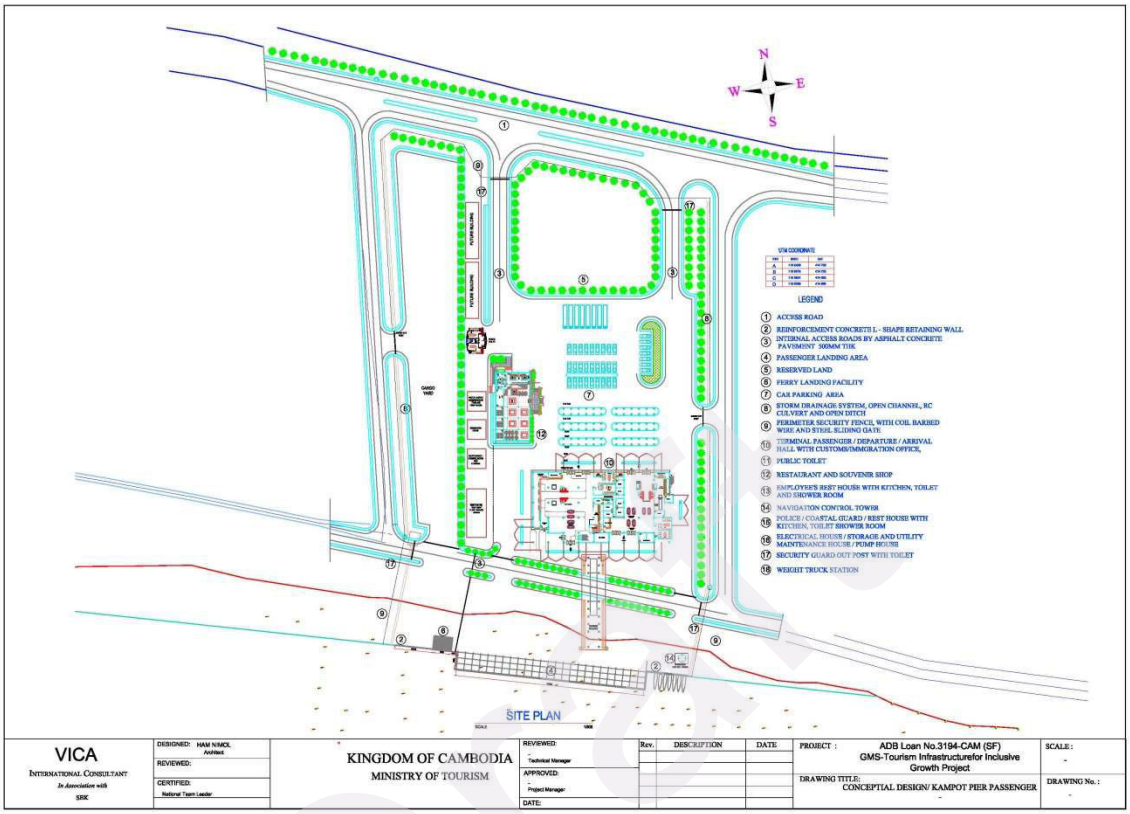


Table 2: Components of New Passenger Pier at Kampot

Activity	General Specifications
Upgrade existing 6.5 km access road	¿ 6.5 km X 6m carriageway ¿ Concrete surface
Install new embankment stabilization structure	
Construct new internal access roads	
Construct new passenger landing area	¿ 1,500 m^2
Construct new jetty and pier	¿ suitable for tidal and flood level fluctuation;
Construct new passenger arrival/departure hall with customs/immigration offices, administration and ticket offices, landscaped tourist reception/information center	¿ total area of 2,500 m^2 ¿ equipment to support customs and immigration operations
Construct new public toilets	¿ with ABR septic system
Construct new parking area	¿ 2,000 m^2
Build new kiosks for food, beverage and souvenir vendors	¿ 750 m^2
Install new power supply and lighting system to all internal and external public areas	
Install new water supply using a borehole	¿ pumps and tanks with back up rain catch technology
Construct new solid waste management	¿ garbage bins
Construct new perimeter security fence	
Install directional and information signage	
Construct other supporting infrastructure utilities	

Figure 3: Plan View of Passenger Pier on Teuk Chhou River South of Kampot Town



Output 2: Environmental Services at Border Tourism Centers Improved

2. Kep Crab Market Environmental Improvements

a. Current situation

36. The small coastal province of Kep is inset in the province of Kampot. The Kep town crab market is located on the seashore about 1.0 km west of the main city beach. The market area includes about 33 vendors and an adjoining small covered dry goods area

.37. West of the market in a large open public area are food stall sand recently constructed public toilets. To the east of the market, stretching for almost 200 m is a row of about 30 privately managed sea food restaurants and stalls built in a linked terrace formation and in many places projecting out over the beach. Sanitation in these structures is by septic tanks built under the structures with no visible means of access and maintenance. Liquid effluent from the tanks as well as kitchen and bathroom sullage is discharged directly into the sea. The market can be easily reached through wide paved city road which leads to an unpaved vehicle parking area running the length of the market and restaurants

38. Limited space within the market area often results in high congestion. Similarly, there is a high incidence of congestion and vehicle/pedestrian in the parking area. Of critical concern is the need to upgrade sanitation and stop untreated effluent discharge to the sea adjacent to the restaurants and food stalls. This prevalent practice can risks public health by taking in contaminated sea food and other consumable goods.

39. Furthermore, there is a need to reclaim certain portion of the nearshore area at the northern side of the market where to set up the ABR and the Infiltration Gallery. This entails additional cost to construct a strong and stable build up area with good foundation and embankment against caving-in and backflow of sea water during high tide, respectively.

40. Shoreline margin creeps inwardly to an average of 0.01 m yearly in Kep, according to local environmental authority in the area (Plate 2). Although this value is insignificant, but such phenomenon signals the eminent occurrence of sea level rise in the area in the distant future. (Source: the Head of the Department of Environment, Kep)

Plate 2: *The sea water margin encroaching the shoreline overtime*

41 It was reported by the locals during a recent stakeholders˘meeting with the Civil Works Group on August 30, 2016 that no underground water has been drawn ever in the entire Crab Market area and the immediate vicinity. People expressed their difficulty of obtaining drinking water and for domestic use from the ground. In such a case, there is no more risk on the possibility of contaminating the underground water due to the treated waste water coming from the Infiltration Gallery. Corollary to this, there is no need to conduct periodic ground water analysis.

42. There is poor solid waste management at the Crab Market. Scattered solid materials, such as plastic bottles, food wrappers and scraps, reconstituted paper containers are present all over the market place and restaurants. All these will go down eventually to the shore (Plate 3). (Source: Direct observation)

Plate 3: *Litter of various sizes and types at the seashore of Kep Crab Market area*

43. Effluents from the restaurants and crab market in Kep are directly drained to the sea (Plate 4). Oil and greasy substance, alongside with the urine and sewage from the toilets and cookeries of restaurants, all these flow directly to the shore and down to the sea. (Source: Direct observation)

Plate 4: *Solid waste and effluents from sewage draining to the sea at Kep Crab Market*

44. Almost all the drainages (canals) are filled and blocked by garbage, consisting of both non-biodegradable and degradable matters. This irresponsible dumping of solid matter along the drainage causes instant flooding due to overflow of run-off water from the upper higher zone of Kep towards the sea. (Source: Direct observation)

45. The long-term stability and loading capacity of the restaurants overtime are questionable. Given the fragile wooden frame material that constituted the crab restaurants, alongside with the increasing number of customers daily, there is the imminent danger of sudden structural collapse in the site (Plate 5). (Source: Direct observation and assessment)

Plate 5: *Semi-concrete wooden structure that constitutes the restaurants ˇframework*

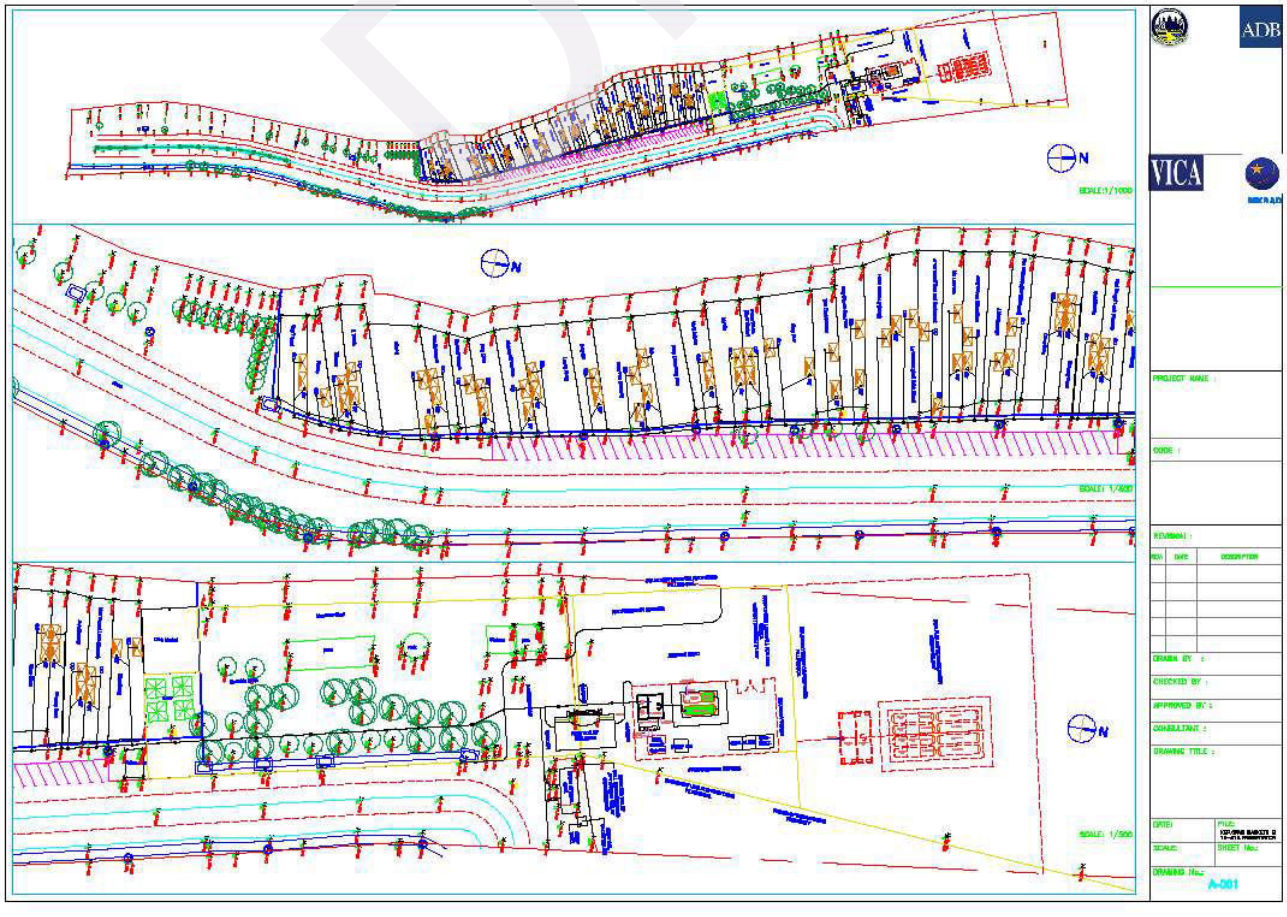
b. Subproject description

46. The subproject activities listed in Table 3 will be implemented to improve environmental conditions in the crab market area, and the overall quality of the tourist experience in Kep town. Figure 4 shows the proposed sketch plan.

Table 3: Summary of Components of Environmental Improvements to Crab Market

Activity	General Specifications
Install new series of anaerobic baffle reactor (ABR) tanks to receive domestic waste	¿ capacity 100m³/day ¿ connected to public toilets, shops and restaurant stalls, not nearby hotels
Expand existing crab market structure to the adjacent dry goods area,	¿ upgrade internal drainage ¿ create area for future cold storage facilities in the crab market
Pave existing parking lot	
Install additional public toilets	¿ linked to ABR system
Upgrade existing waste management system of market area	¿ including provisions for routine de-sludging of ABR septic tanks
Upgrade existing power supply and install improved lighting to the market and adjacent open areas	
Install signage in key locations	

Figure 4: Existing Lay-Out and Proposed Master Plan of the Seaside Crab Market in Kep



47. Placement of the ABR tank underneath existing restaurants would allow waste to fall a short distance by gravity through a single collector pipe to the ABR, whereas, waste would have to be collected to a central point and pumped up to the car park location depending on grade and the depth of the ABR tank(s). At either location the ABR would be constructed of reinforced concrete with cast-iron access covers, and designed to be physically isolated from the surrounding environment. The access covers would be accessed when de-sludging of any of the compartments was required. Sludge would be discharged at a landfill or disposal area that is approved by the MOE. A candidate site for consideration for sludge disposal is the site selected by MOE for the sludge from the ABR system at the new Kampot pier.

48. The proposed ground location of the Anaerobic Baffle Reactor at the northern most part of Kep Crab Market is at lower elevation than the source of waste water and sewage (Figure 4). As such, there will be gravitational flow of waste water and septage to the receiving tank. However, its being relatively at the lowest ground level, it becomes a natural passage of run-off rain water flowing down to sea. In this case, there is the need to re-route the direction of drainage system, by-passing the ABR area.

49. The outlet of the ABR tank channels the liquid phase into an infiltration gallery which forms the passive treatment plant of the system. The raw waste is conveyed out to the infiltration gallery through either slotted PVC pipe or drain coil. The gallery would be installed underneath the new promenade that has yet to be constructed north of the crab market. There is a limited area for this unit. Thus, the reclamation area should be extended farther northward from the market.

50 The raw effluent moving from the ABR tank(s) to the adequately designed capacity infiltration field would have no environmental impact because the filtration field allows passive assimilation of the wastewater into the bed of the field. The filtration capacity of the area around the ABR's would need to be re-checked prior to installation to ensure that there is enough area, proper soil, and no domestic groundwater wells.

51. Air quality within the ABR and Infiltration Area could be potentially affected by the system in terms of the foul odor being emitted. In such a case, there is a need to plant ornamental trees and flowing plants surrounding the ABR area, not only for aesthetics but more as wind break, temperature and air quality conditioner.

<u>Underground tank option</u>

52. If the permeability in the area of the crab market is low the alternate option would be to provide underground tanks in which to capture the wastewater. While not the best solution these tanks would store the wastewater until such time as a tanker had the opportunity to pump these tanks out for discharge at a landfill or disposal area that is approved by the MOE.

53. The ABR technology has been used extensively in Indonesia for small communities and has proven very successful hence the proposal for utilizing an ABR system in Kep market area. Detailed design will determine the required number of ABR units. The typical flow range for an ABR is from 2,000 to 200,000 l/day with size being dependent on the wastewater generating capacity of the crab market. Because the ABR must be de-sludged regularly vacuum trucks must be able to access the ABR areas easily, which

the parking lot location will provide. And, as indicated above the location for disposal of the ABR sludge must be determined by MOE.

54. Directly discharging the treated waste water from the Infiltration Gallery to the sea may adversely affect the rich marine life in the immediate coastal environment. Fisherfolks in the area depend greatly on the crab, squid and fish catch from nearshore fishery ground for their food and source of income. In this case, there is a need to constantly monitor the quality of the treated waste water to ensure that it meets the required threshold standard without causing any subsequent change in the marine life population. Likewise, it is recommended to conduct a yearly macro-benthic assessments along the intertidal flat where the treated waste water is discharged. The aim is to determine any change in the composition of the substrate that serves as food for marine life.

Summary of features

55. The positive and negative features of the ABR system are summarized as follows:

Positive

- ¿ resistant to organic and hydraulic shock loads
- ¿ no electrical energy required
- ¿ grey water can be managed concurrently
- ¿ can be built and repaired with locally available materials
- ¿ long service life
- ¿ few problems with flies or odor if used correctly
- ¿ high reduction of organics
- ¿ moderate capital costs, moderate operating costs depending on emptying: can be low cost depending on number of users

Negative

- ¿ requires constant source of water
- ¿ effluent requires secondary treatment and/or appropriate discharge i.e., planned filtration gallery field
- ¿ low reduction in pathogens at the exit of ABR tank (but total assimilation with infiltration field)
- ¿ requires expert design and construction
- ¿ pretreatment (screens or grease traps) may be required to prevent clogging (such as installing grease and oil traps at source)

Maintenance

56. The ABR tank should be checked to ensure that they are watertight and the levels of the scum and sludge should be monitored to ensure that the tank is functioning well. Because of the delicate anaerobic treatment environment in the ABR, care should be taken enter harsh chemicals into the ABR. The sludge should be removed and disposed annually using a vacuum truck to ensure proper functioning of the unit. Figure 5 summarizes the geographic relationship between subprojects in Kampot and Kep.

Figure 5: Location of all Subprojects in Kampot and Kep, Cambodia

IV. DESCRIPTION OF AFFECTED ENVIRONMENTS

57. The description of the affected environments focuses on the environmental features that could possibly be affected by the subprojects, or could possibly influence the implementation and successful operation of the subprojects.

A. General Country Environmental Profile

A1. Climate

58 Southern Cambodia experiences a tropical monsoon climate with two distinct seasons: (i) the dry season from approximately November to April associated with the northeast monsoon which provides drier and cooler air with February being the driest month; (ii) the wet season from May to October during which rainfall is largely derived from the southwest monsoon drawn inland from the Indian Ocean.

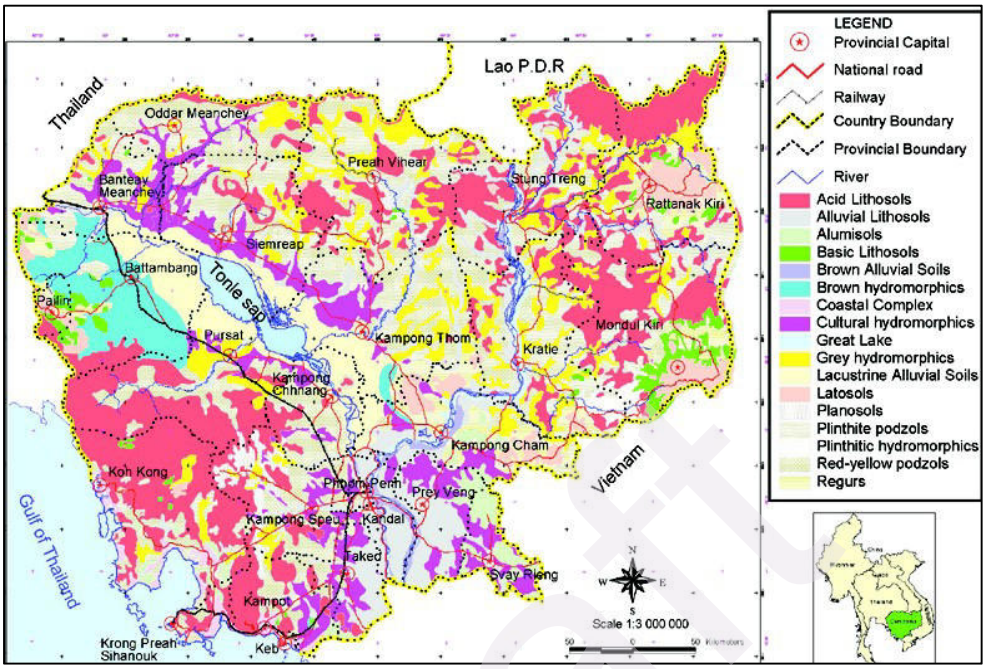
59 The rainfall pattern is bi-modal with peaks in June and September/October. In the dry season, the temperature of the province is high in April with an average of 36.6C and the coldest month is February with an average temperature of 21.10C. The average annual rainfall in Kampot-Kep is 1,407 mm with the greatest level recorded being 2,604mm.

i. Soils

60 The soils of coastal Kampot and Kep are dominated by a mix of old and young alluvium soils of sediment deposits from rivers and streams (Figure 6).[7]These are mainly finer sediments, thus a high concentration of silt is found in the coastal and near shore areas. Alluvial deposits normally result in fertile land.

[7] MOE 2004

Figure 6: Soil Types of Cambodia

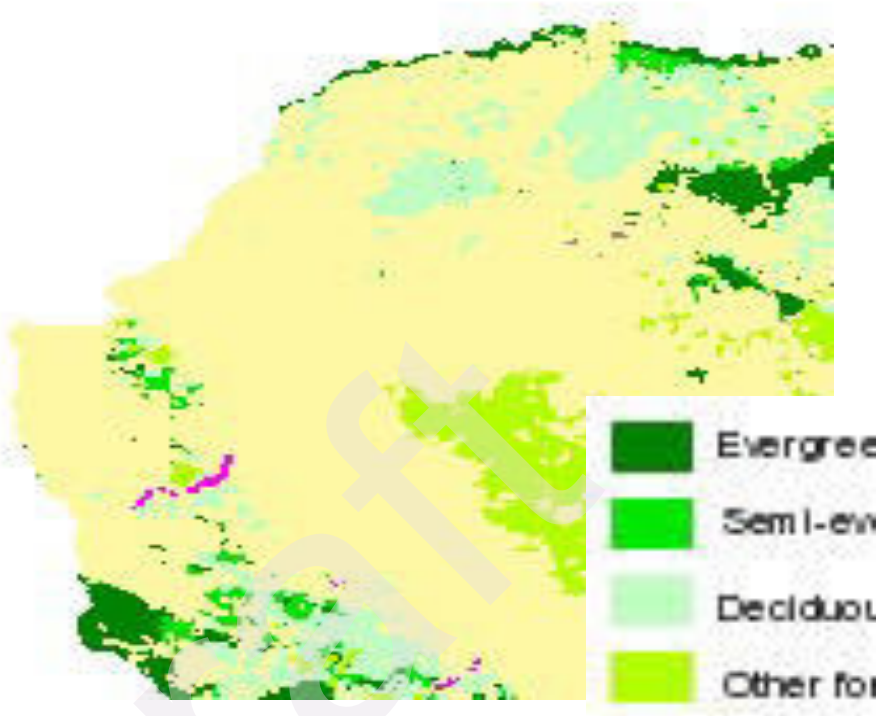


ii. Forest Areas

61. The forest types/areas of Cambodia are shown in Figure 7 (Forest Types of Cambodia)[8] Most of the major forests are situated in the southeastern, central, and northeastern regions of the country. Forest cover in Kampot and Kep is relatively sparse with most forested areas located in Bokor National Park northwest of Kampot subproject site and in Kep National Park east of the crab market.

Figure 7: Forest Types of Cambodia

[8] NREM DATA TOOL BOX -Royal Danish Embassy- Danida - Phnom Penh, Cambodia, March 2007.



A2. Bio-physical Features

62. The topography and land use of the coastal zone south of Kampot town is characterized by a mix of relatively sparse agriculture, salt harvesting fields, and mangrove forests which occur along the Teuk Chhou River which flows through Kampot town south to Kampong Bay. The salt producing operations (seawater evaporation) adjacent to the Teuk Chhou River are extensive and dominate the land use of the area.

i. Rivers

63. Many rivers drain to the coastal area some of which commonly dry up in the dry season. During the dry season the lower reaches of the rivers are brackish. Some rivers discharging to Kampong Bay near the subproject area are shown in Table 4

Table 4: Rivers Discharging to Kampong Bay near the Subproject Area.

1. Kbal Rome as River flowing from Kam Chai Mountain in Kampot district.
2 Teuk Chhou River* flowing through Kampot town south to Kampong Bay
3. KohToch River, flowing from Bokor area in Kampot district.
4. Kdart River flowing from Bokor area in Kampot district.
5. Smach River flowing from Bokor area in Kampot district.
6. Thnaout River flowing from Bokor area in Kampot district.
7. Trapeang Ropov River flowing from Bokor area in Kampot district.

*Passenger pier will be located on east bank of TeukChuu River above river mouth.

ii. Surface Water Quality

64. The freshwater and coastal water quality of Cambodia is comparatively good compared to other regions of Southeast Asia. However, the steadily increasing industrial development, intensive agriculture, and deforestation in Cambodia is reducing the quality of surface waters in different areas due pollution from untreated effluents, land erosion, and agriculture chemicals.

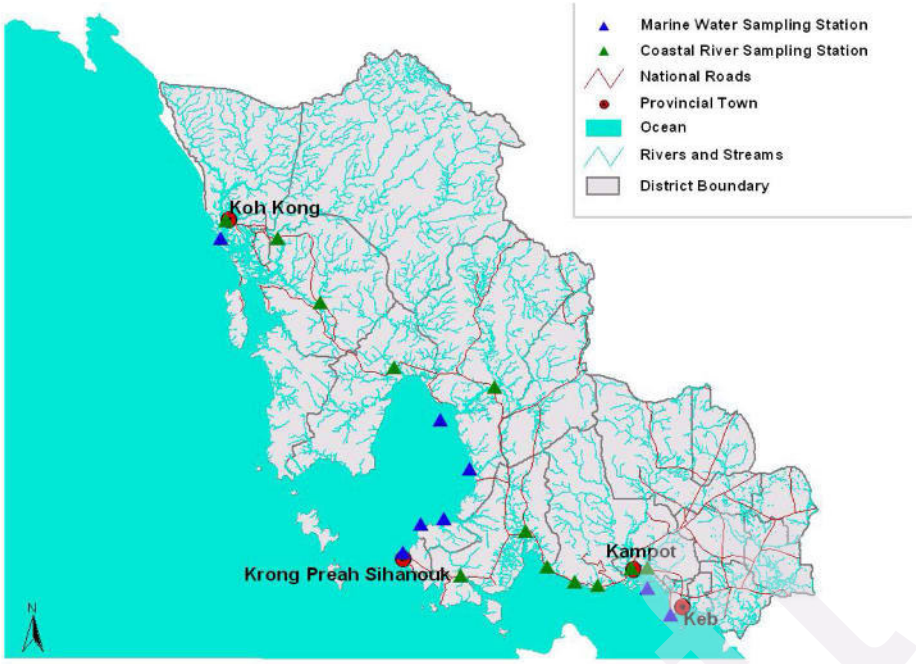
65. A summary of water quality during the dry season at river and coastal sites is summarized in Table 5. Recent water quality survey sites for Kampot and Kep are shown in Figure 8.[9]

Table 5: Dry-season River and Coastal Water Quality 2005 - 2006

Variable	Average	Maximum	Minimum	Government Standard
River 288 samples from 12 sites				
Temp	30.5	33.2	27.6	
pH	7.7	8.1	7.3	6.5 - 8.5
Salinity (‰)	12.9	20.3	3.8	
Secchi depth (m)	1.4	1.9	0.8	
total suspended solids (mg/l)	11.1	26.5	2.7	25-100
dissolved oxygen (mg/l)	5.2	6.1	4.5	2.0 - 7.5
biological oxygen demand mg/l)	0.7	1.2	0.4	1 - 10
total nitrogen (mg/l)	0.09	0.18	0.04	
total phosphorous (mg/l)	0.008	0.02	0.002	
Coastal 96 samples from 8 sites				
Temp	29.6	32.5	26.1	
pH	7.8	8.1	7.6	7.0 ¯ 8.3
Salinity (‰)	25.8	30.1	20.8	
Secchi depth (m)	1.9	2.3	1.3	
total suspended solids (mg/l)	17.7	37.6	3.1	
dissolved oxygen (mg/l)	5.3	6.0	4.7	2.0 - 7.5
biological oxygen demand mg/l)	0.7	1.1	0.3	
total nitrogen (mg/l)	0.1	0.21	.05	0.1 - 1.0
total phosphorous (mg/l)	0.008	0.018	0.002	0.02 ¯ 0.09

Figure 8: Water Quality Sampling Sites in Kampong Bay and near Kep

[9] DOE and Danida, 2006. Second Annual Monitoring Report for Coastal Rivers and Near shore Coastal Waters of Cambodia.



A3. Protected Areas

66. There are two ecological protected areas in Kampot and Kep provinces in the vicinity of the subproject areas (Figure 9). Bokor National Park in Kampot is located approximately 25 km northwest of Kampot. Kep National Park is located 2 km east of the coastal urban crab market.

67. The important bird areas (IBA)[10] in the region are located inside the two national parks and away from the subproject areas (Figure 10). There are no rare or endangered terrestrial wildlife in the subproject areas.

Figure 9: Location of Bokor and Kep National Parks near Subprojects.

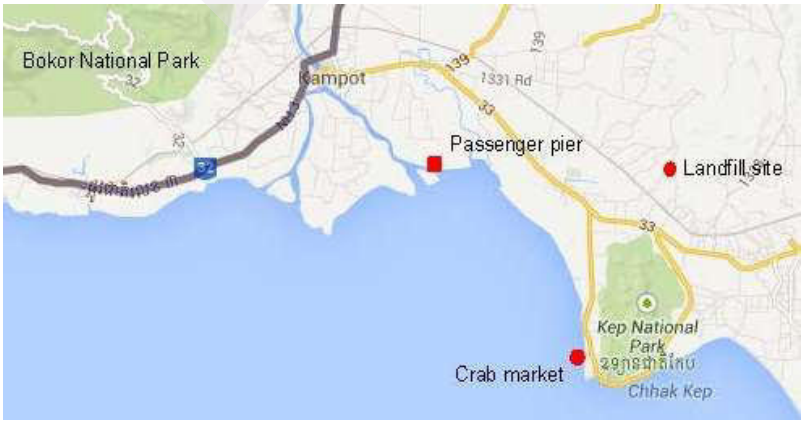
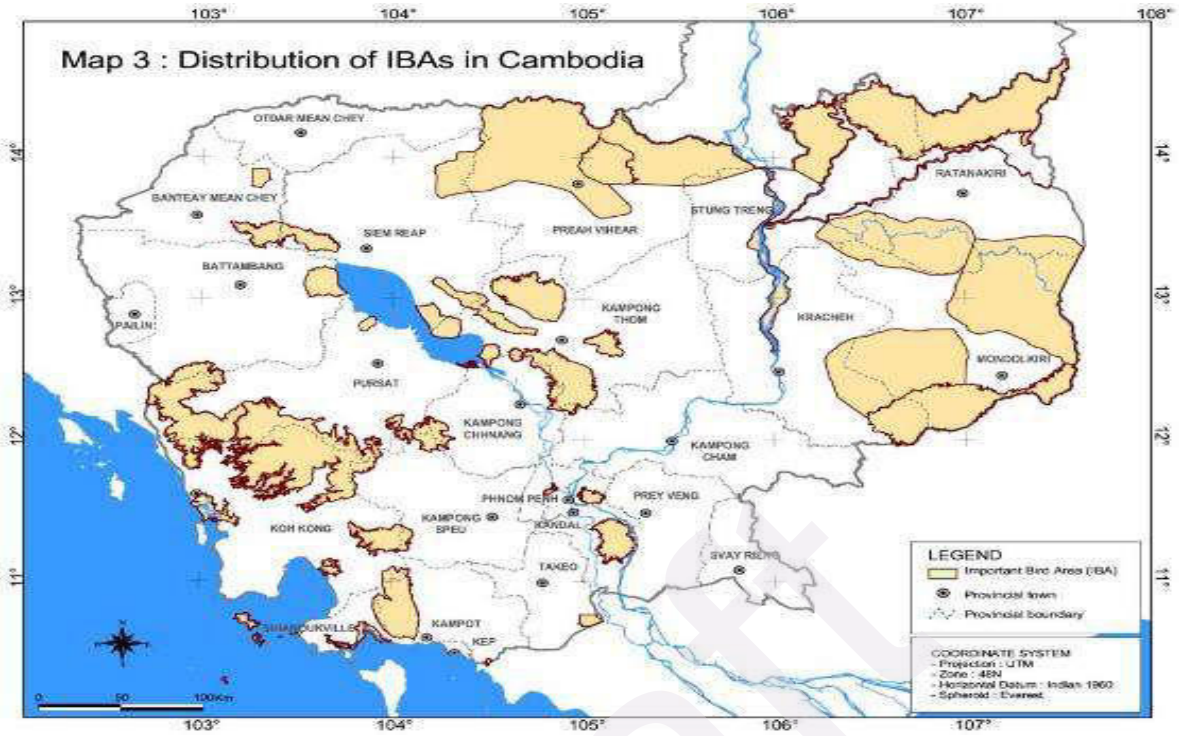


Figure 10. Important Bird Areas in National Parks North of Kampot and Kep Towns

[10]http://birdlifeindochina.org/datazone/14



A4. Marine Coastal Zone of Kampot and Kep

68. Kampot and Kep along with the provinces of Koh Kong and Sihanoukville form Cambodia's coastal zone along the Gulf of Thailand. Cambodia's coastal resources play an important role in the country's development by supporting the fisheries, aquaculture, agriculture and tourism sectors. Of particular importance are the role of mangroves, sea grass, and corals in the fisheries and tourism industries.

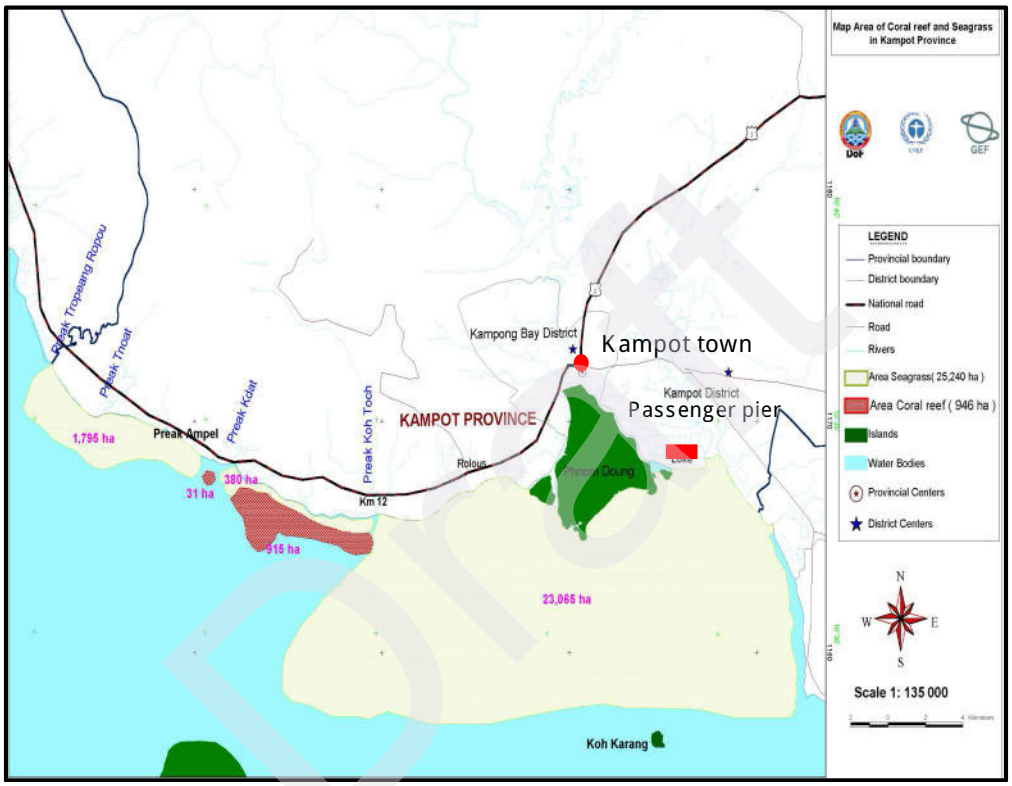
i. Sea grass

69. Cambodia's coastal zone supports one of the world's largest areas of sea grass habitat in the shallow near shore zone. [11] This critical habitat provides rich reproductive, nursery, and feeding habitat for many different species including rare and endangered species such as the Dugong marine mammal, sea turtles, seahorses, and an array of finfish and shellfish. The defined sea grass beds of Kampot and Kep with particular reference to the estimated 25,420 ha sea grass off Kampot is also critical habit for inshore and offshore fisheries (Figure 11 and

[11] UNEP 2009.

Figure 12).

Figure 11: Coral Reefs and Sea grass in Coastal Zone of Kampot.

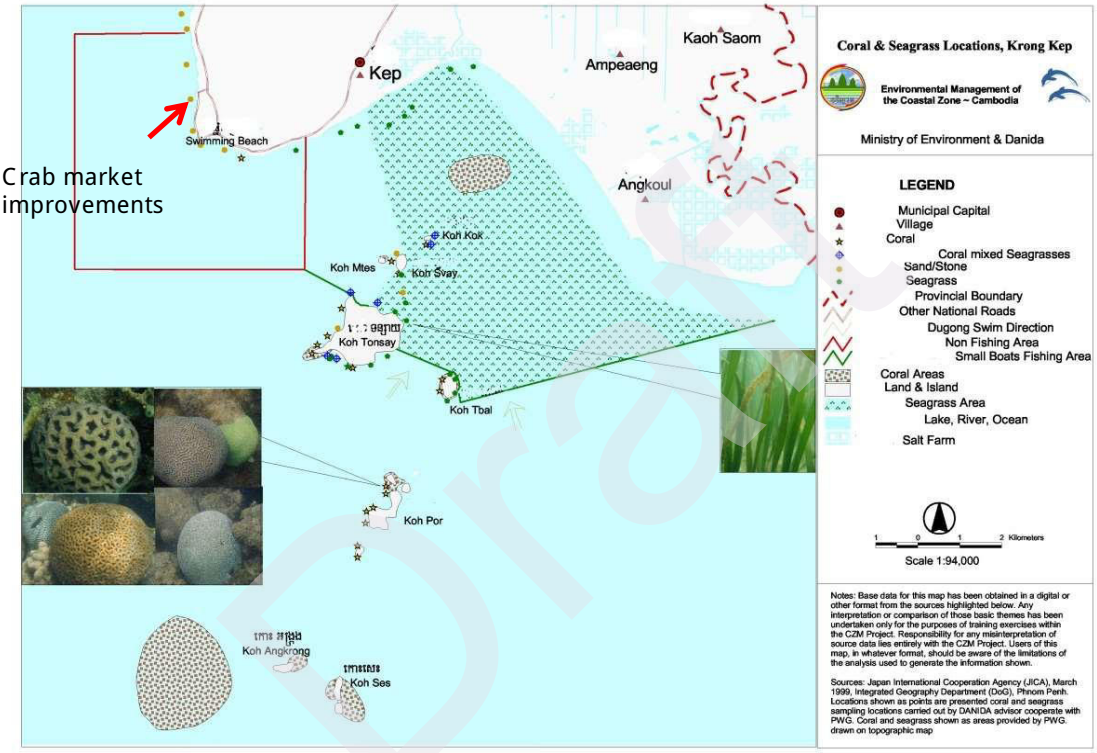


ii. Coral Reefs

70. Cambodia supports an estimated 2,700ha of coral reefs with the most extensive coverage occurring in Kampot and Sihanoukville[12] with coral also found off Kep. Approximately 70 coral species are found within the coastal zone, though little is known about the relative distribution and composition of the reefs. These reefs are threatened by development, overfishing, coral harvesting degradation of the water quality, and destructive fishing practices such as dynamite.

[12] See footnote 13

Figure 12: Sea grass Beds and Coral Areas of Kep. Note Dugong Migration Route.



71. There are indications that sea grass habitat is being lost to degraded water quality from increased turbidity caused by forest clearing, shoreline infilling, sand dredging. The Fisheries Administration of MAFF has produced a National Action Plan for Coral Reef and Sea grass Management in Cambodia (2006-2015).[13]

iii. Mangroves Forests

72. The area of mangrove forests along the coastline of Cambodia has declined significantly over the last two decades. However, the estimated 56,000 ha that remains represents a rich resource and area of critical habitat in relation to other areas in Southeast Asia. Koh Kong province supports the largest area of mangroves. Similar to sea grass, mangrove forests are critical habitat and play an essential role in the lifecycle of many marine organisms, and provide spawning or nursery grounds that support the rich biodiversity of fish species which include commercially important

[13] MAFF, 2006.: National Action Plan for Coral Reef and Seagrass Management", 2006-2015.

species. The mangroves forests of Koh Kong provide habitat for two rare and endangered species of otter: the smooth-coated and the hairy-nose dotters.

73. Dense mangrove forests grow along the west bank of the Teuk Chhou River south of Kampot, and extend west along the coastline around and beyond the Phnom Dong headland (
Figure 13). Mangroves also exist east of Kep town.

Figure 13: Boat Channel (blue) and Sea grass and Mangrove Areas (green)

74. Mangroves also play an essential role in protecting the coast line and provide an effective buffer against climate change-related sea level rise, cyclonic activity and storm surges. Mangrove loss is due to shoreline infilling and development, illegal harvesting for firewood and charcoal, and shrimp aquaculture among other uses. Mangroves are reported to be further damaged and degraded by offshore and estuarine sand dredging.

iv. Marine Fisheries

75 Estimates[14] of the average annual catch of fish in Kampot province is between 7,000-8,000 tones, and over 450 tones in Kep. Based on Fishery Administration Report, annual fish catch in 2015 is 9,682 tones in Kampot province and 2425 tones in Kep. This suggests the increasing fish productivity in both provinces, an indication of a healthy marine ecology. There has been a shift from smaller to bigger boats and the direction of fishing operation offshore. The overall fish catch has been increasing since about 1980 due to the growing number of fishermen, mostly employing commercial-scale and highly sophisticated technologies. However, fish catch per capita has been steadily declining, principally due to an increasing coastal population and unrestricted development in ecologically-sensitive habitats.

76. Early estimates indicated that there were over 416 motorized fishing boats in Kampot which will have increased significantly to date. The common groups of fishes caught include fishes, shrimps, and octopus. Coastal fishing communities may be boosted following the advent of Community Fishing Area Management Plans (CFAMP)[15]along the coastline. The plans detail activities and goals for improved resource management and community development but currently suffer a lack of a baseline understanding of current resources.

A5. Land Use at Subproject Sites

77 Land use in Kampot and Kep province ranges broadly from small and large settlement areas such as Kampot town to barren areas commonly seen as such rock outcrops. Dense broad leafed forest is found within the Bokor Mountain National Park in the eastern part of the province. On the flatter coastal plain areas including Kampot and Kep towns rice paddy and salt farms predominate.

i. Passenger Pier at Kampot

78 The land adjacent and north of the site for the passenger pier on the east bank of the Teuk Chhou River and along the access road is dominated by salt farms that are fringed with scrub vegetation (Plate 3). Other agriculture in the area includes rice, fruit, and vegetables.

79 The mangroves that once that lined the east bank of the river were removed by a land developer before 2005. Whereas, dense mangrove forests still exist directly across the river from the pier site. Much of the mangroves located on the west bank of the river including the small island between the existing boat channels from the river out to Kampong bay were replanted by an earlier Aus Aid-funded project (
Figure 13).

80 The current channel used by boat traffic in/out of the river shown in
Figure 13 was identified by the Director of the Fisheries Administration of MAFF in Kampot. The bifurcated boat channel is consistent with observations during preparation of the project.

81

[14] MOE and Danida, 2002. State of Environment Report for Kampot
[15] The CFAMPs developed collaboratively by Fisheries Authority and communes. SorSarin, DAF pers comm. 2013

Figure 13 also shows the existing 300 ha sea grass conservation area just east of the mouth of the Teuk Chhou River, and the sea grass areas west of the river mouth that were demarcated with existing concrete piling markers with earlier AusAid funding. There are plans to designate the sea grass west of the river as conservation zones similar to the existing eastern conservation zone.[16]These inshore sea grasses form part of the massive coastal sea grass area.

82
Figure 14 shows the denuded shoreline on the east bank of the Teuk Chhou river where the passenger pier will be built. The mangrove restoration project funded by AusAid is shown on the opposing shore in the background. East of the pier site (
Figure 14) there are scattered mangroves left behind after the shoreline was cleared before 2005. These mangroves will be incorporated into the design of the pier facility with minimal removal to provide an interpretive-awareness raising demonstration of the importance of mangroves for tourists who use the pier. The access road runs along the river before veering north east through salt fields and small agriculture to meet the main road into Kampot town.

Figure 14: Passenger Pier Site on East Bank of TeukChhu River and Access Road.

83 Other Development Activities. There are no other ongoing development activities, or known development plans south of Kampot to the site for the passenger pier. The only existing activities along the access road to the pier from the main highway are salt farming and homestead agriculture of rice, fruits and vegetables. To the west along the coast towards Sihanoukville the next major development is the Kampot international cargo port.

Crab Market Area

84 The crab market area is situated in a typical small urban seaside setting (Figure 15). Land use near the market is a combination of small commercial spaces, restaurants,

[16] Pers Comm. Mr. SorSarin, Director of Fisheries Administration, Kampot

small hotels, beach activities, and houses. A shoreline road with seawall with groomed trees, shrubs, and gardens extend from the market.

Figure 15: Crab Market and Adjacent Shoreline Road

Other Development Activities.

85. Urban and tourist development in the crab market area in Kep continues to evolve at the level of the individual restaurant or crab shop. The municipality is in the process of improving the coastal rim of the town with ongoing construction of a coastal road and seawall with landscaped promenade. The small tourist strip of beach hotels southeast of the crab market is expected to continue to expand. Industrial or large scale urban development in Kep town is not present.

Quality and reliability of information and data

86. The availability of information and data on the affected subproject environments in Kampot and Kep varied among subproject components. The published data and information on the coastal resources in near shore Kampong bay was good which also was corroborated by local environment agencies such as the fisheries section of MAFF and the DOE. Observations and information obtained from the social surveys provided a good understanding of affected social and natural environments along the access road to the future passenger pier. The available data and information on affected environments provided a good basis for the IEIA.

87. Understanding of affected natural and social environments in Kep was compiled from published accounts such as the latest State of Environment Report for the province,[17] extensive observations, and discussions with provincial environment agencies. The literature on the coastal resources of Kampot included Kep due to the juxtaposition of the two coastal provinces. The existence an scope of potential future development plans for Kep town are not clear as the town lacks an urban development plan.

V. PUBLIC CONSULTATION

88. The stakeholder consultation strategy during project preparation embodied the principles of meaningful engagement, transparency, participation, and inclusiveness to ensure that

[17] Footnote 6.

affected and marginalized groups such as women and the poor were given equal opportunities to participate in the design of the project, in accordance with the requirements ADB's Safeguard Policy Statement (2009). Stakeholder consultation for the environment built upon the parallel social impact assessment of the various subprojects.

89 The approach to stakeholder consultation for environmental concerns or issues associated with the Kampot and Kep subprojects consisted of the following three avenues of inquiry and data collection:

a) As part of the household and village leader interviews conducted by the social development team;
b) Separate group consultations with provincial agencies and other stakeholders by social development team and an additional environmental research assistant hired during the interim mission; and
c) Individual interviews conducted by the International Environment Specialist with provincial and national environmental management agencies.

A. Identification of Stakeholders

90 Stakeholders were identified and engaged in a participatory manner. Stakeholder communication to date has focused on institutional stakeholders, affected communities, and persons directly affected by proposed subproject interventions. The stakeholders involved in the design of the project include:

¿ Institutional stakeholders including the (i)project EA and PIUs (ii) provincial and national agencies; private sector groups, chambers of commerce and potential participants in private public partnerships (PPP);
¿ The Department of Women's Affairs also provided information on the design of the various sub project activities, and may continue to provide insights for implementation of subproject activities. The World Wildlife Fund (WWF) was consulted separately about the project in a meeting in Phnom Penh.[18] WWF is not operating in the project area, but was positive and supported both subprojects in Kep and Kampot. The Children and Women's Development Centre (CWDC) was also consulted separately in Kampot. See Appendix B for the potential role of CWDC with mangrove restoration;
¿ Communities living along the subproject areas who will benefit from the project, and who have an interest in identifying measures to enhance or maximize the benefits;
¿ Communities within the subproject area who may be directly and/or adversely affected, and who have an interest in the identification and implementation of measures to avoid or minimize negative impacts;
¿ Vulnerable and/or marginalized groups who have an interest in the identification and implementation of measures that support and promote their involvement and participation in the project; and
¿ Other institutions or individuals with a vested interest in the outcomes and/or impacts of the project.

[18] Mr. ThibeaultLedecq, WWF-Cambodia, Phom Penh 18/11/13

B. Discussion Guide

91. Five questions and information requests (Table 6) were posed to stakeholders to guide discussions of the individual and grouped stakeholders.

Table 6: Guiding Questions and Information Requests for Stakeholder Consultations

1. What will be the benefits of the subproject? Please list benefits of project. 2. Do you have any environmental concerns with the subproject? Please list environmental concerns of project. 3. Do you any have environmental concerns with the construction activities of the subproject? Please list environmental concerns of construction phase activities. 4. Do you have environmental concerns with the completed operation phase of the completed subproject? Please list environmental concerns of the operation of completed subproject. 5. Do you think the subproject design or operation should be changed to prevent negative environmental, or community impacts? Please list changes to subproject that you think will prevent or reduce negative environmental, or community impacts?

92, To help orient the discussions on environmental issues and concerns of subprojects a list of environmental components (Table 7) was introduced to the stakeholders ahead of the question and answer period. The stakeholders were encouraged to add their own components of environment to the discussions.

Table 7: Example Environmental Components Used to Guide Stakeholder Discussions.

¿ drinking water quality and availability ¿ surface water quality and quantity ¿ groundwater quality and quantity ¿ air quality ¿ climate ¿ land and soil quality ¿ coastal zone, ocean, rivers, reservoirs, ¿ mangroves, trees, other vegetation, ¿ coastal and terrestrial resources e.g., seagrass beds, mangroves, forests, salt beds	¿ terrestrial and aquatic animals, e.g., fish, birds, small mammals ¿ ecological protected areas (e.g., national parks, wildlife sanctuaries), ¿ land and coastal zone uses (e.g., agriculture, fisheries, forestry, navigation, aquaculture, commercial, other), ¿ public safety ¿ public movement and access ¿ physical cultural values (e.g., pagodas, cemeteries, monuments)

C. Summary of Public Consultation

93. The stakeholder consultations showed overall positive support for the project and its subprojects in both provinces.

Table 8 and Table 9 summarize the comments and concerns of (i) individual households (ii) village heads and (iii) district, provincial and private sector stakeholders that were consulted in focus groups lead by national discussion leaders. The tables also present a summary of interviews with provincial environment agencies conducted by the International Environment Specialist.

94 Also summarized in Tables 8 and 9 is how the EMPs for Kampot and Kep will respond to the environmental issues and concerns that were raised by stakeholders. The follow-up stakeholder consultations that may be required during the detailed design phase will begin with a review of the issues and mitigations initially identified by the stakeholders.

Table 8: Summary of Stakeholder Views of the Passenger Pier Development in Kampot

Benefits of passenger pier expressed by stakeholders	¿ Attract more tourists and increase income of local people through tourism supported business such as restaurant, accommodation and transportation; ¿ Upgrade the existing road, and gain new road; ¿ Reduce travel time along the proposed road; ¿ Support urban planning program; ¿ Improve the channel for better navigation; ¿ Improve the drainage system along the river bank; ¿ New water supply to the proposed pier; ¿ New electric reticulation to the proposed pier; ¿ Support the development plan of the province of Kampot; and ¿ Contribute to the GDP growth of Cambodia	
		Project Response[19]
Construction phase issues	¿ Loss of seagrass and mangroves, and therefore biodiversity; ¿ Loss of fishing grounds ¿ Waste from the construction material; ¿ Dust and noise from the construction activities; and ¿ Disturbance to the navigation during the construction	¿ The EMP for Kampot specifies requirements of boats to use only the existing channel out and beyond conservation seagrass beds and inshore fishing grounds in Kampong Bay. ¿ Specific mitigation sub-plans of EMP will address noise and dust from construction. ¿ A specific mitigation sub-plan in EMP will prescribe no-disruption of existing boat traffic during

[19] Views of stakeholders are addressed in EMPs

		construction phase.
Operational phase issues	¿ Independent `side effect_ development along coast line resulting in expanded loss of coastal resources and wildlife habitat; ¿ More people, more waste with limited waste management system; ¿ Water quality due to limited waste management; ¿ Small concerns with the air quality due to dust. More people, more waste with limited waste management system; ¿ Water quality due to limited waste management; and ¿ Small concerns with the air quality due to dust.	¿ The east bank of Teuk Chhou river alternate site minimizes potential impacts of induced development along adjacent shoreline. ¿ Pier facility management includes formal solid and liquid waste systems to protect quality of land and Teuk Chhou River. ¿ The completed concrete road upgrade and pier facility area will be designed without large dirt/gravel surfaces to prevent dust generation.
Suggested impact mitigation measures	¿ Liquid and solid waste management system at the pier should be done in order to minimize the environmental impacts; ¿ Keep the existing vegetation along the river bank as possible or plant more if not exist; ¿ Standard construction management on both safety and environment; ¿ Minimize the impact on water flow for salt fields; and ¿ Human resources development on the operation and management of the passenger pier. ¿ Compensate fisherman if there are lost fishing grounds (fishing income and livelihoods)	¿ The design of the pier facility, and associated impact mitigations of EMP will address solid and liquid waste concerns. ¿ Passenger pier site selected in part to prevent any lateral mangrove loss. ¿ Access road upgrades and bridging, and new pier facility will be designed to maintain existing flow to/from salt farms. ¿ Government and World Bank EHS (2007)construction guidelines for worker and public safety will be employed ¿ Specific mitigation sub-plans will be developed where necessary for the impacts associated with the mitigations. ¿ Compensation for property or livelihood losses will be prescribed as needed in separate social safeguard documents ¿ Human resource development for operation of the pier is an explicit component of the separate Output 3 the project.

Table 9: Stakeholder Views of Kep Environmental Improvements

Benefits of crab market improvements,	¿	Good environment can attract more tourist and increase income of local people through tourism supported business such as restaurant, accommodation and transportation;

	¿ Improve the hygiene for tourists; ¿ Improve the ecology of the coastal zone of Kep; ¿ Support urban planning program; ¿ Support the development plan of the province of Kep; and ¿ Contribute to the GDP growth of Cambodia; ¿ Increase household income; ¿ Improve sanitation and environment; ¿ Improve people's health; ¿ Increase job opportunity; ¿ Attract more tourists.	
		Project Response
Construction Phase Issues	¿ Construction material waste from crab market discharged to the sea; ¿ Dust and noise from the construction activities; and ¿ Disturbance to the daily business in the crab market. ¿ The construction phase at the crab market may disturb the business of the seller in the crab market	¿ Specific mitigation sub-plans of Kep EMP will address noise and dust from construction. ¿ EMP will prescribe for procedures to collect and dispose construction waste. ¿ EMP will prescribe a formal crab market community meeting ahead of construction to clarify a plan to minimize disturbance from construction activities. ¿ Grievance Redress Mechanism of EMP will also provide means for community to voice concerns during construction phase.
Operational Phase Issues	¿ Smell and noise of the waste water treatment; and ¿ Management of the waste water treatment plant.	¿ Design and operation of ABR septic and infiltration field system. Operation of ABR will be monitored as part of EMP.
Suggested Impact Mitigation Measures	¿ Temporary places for crab market sellers should be found in order to maintain their business if required; ¿ Manage the waste and noise during the development at crab market; ¿ Strongly suggest recycling the treated water to use for watering the garden or other purposes (not for drinking) rather than release to the sea since the water resource is limited in Kep; and ¿ Human resources development for the operation and management of the waste water treatment plant (ABR system).	¿ Where needed, temporary locations will be provided for existing sellers/stalls. ¿ Mitigation of noise and waste will be addressed through management plan for improved crab market. ¿ Treated effluent of ABR infiltration system will exceed Government industrial effluent discharge standards.

VI. POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATIONS

95. The assessment of potential impacts of the subprojects in Kampot and Kep provinces is structured by the primary infrastructure developments as defined by:

- ¿ New passenger pier facilities and access road upgrades; and
- ¿ Crab market environmental improvements including new ABR waste treatment system.

96. The impact assessment was stratified by major subproject component not by province because the potential impacts of the different infrastructure types are generally similar. The provincial-specific aspects of potential impacts can be highlighted with minimal repetition of the assessment.

A. Subproject Benefits

i. Passenger Pier and Facilities

97. The new passenger pier will increase tourism in the area, and develop the local and ultimately the regional economies of Kampot and environs as identified by the stakeholders in

Table 8. The new passenger pier facility could also enable consolidation the existing small cargo port just south of Kampot there by providing increased tourist and cargo access to Kampot and the area. By using the new pier, the existing small cargo fleet would have year-round ¯ 24hr access to the port and will not have to continue with the current practice of off-loading cargo downstream during low tide or dry season conditions. The existing cargo pier will not be closed.

98. It is estimated the pier and associated facilities will create 2,500 tourism-related jobs[20]through expanded land and sea transportation services, customs and immigration facilities, and expansion of other tourism services in Kampot. Residents of the commune Chum Kriel with a population of 5,282 will benefit from new tourism-related economic opportunities. The salt farmers that live along the access road will benefit from more affordable and reliable transportation options.

ii. Crab Market Environmental Improvements

99. The environmental improvements at the crab market will significantly increase the quality of the beach area by ending the current practice of discharging raw sewage from the market and food stalls to the beach area. This in turn will improve water quality for the near shore cage storage areas for crab for the market and improve the overall aesthetics of the area for tourism development. The project will improve sanitation and environmental conditions for the 33 shops/restaurants and 300 mobile vendors presently operating at the crab market, and is expected benefit upwards of 12,700 people living in the area adjacent to the market area.

[20] Quantified beneficiaries of subproject sites are consultants estimated reviewed by ADB.

B. Subproject Impacts and Mitigations

100. The assessment of potential negative impacts of the primary infrastructure developments is structured starting with the pre-construction preparation phase, followed by the construction phase, and ending with the post-construction operation phase of the commissioned infrastructure developments. This assessment structure is carried forward and is used to structure the environmental management plans (EMP) prepared for the subprojects.

i. Pre-construction Phase

101. Negative impacts associated with the pre-construction phase of the sub-projects concern land acquisition, resettlement, and temporary livelihood disruptions. At the feasibility stage approximately 35 household/businesses will likely be disrupted in the Kep market area during the construction phase. No significant resettlement is expected to be needed as a result of the new pier and upgraded access road at Kampot. The impacts and management actions are addressed in more detail in the Resettlement Plan for the subprojects prepared under separate cover.

a. Local soils and groundwater study at crab market

102. The depth and quality of the groundwater, and the soil type at the crab market are not well understood. Critical for the design and operation of the ABR septic system and infiltration gallery is a good understanding of the soil type, water table depth, and groundwater quality. A local groundwater and soils investigation will be needed during the pre-construction-detailed design phase.

b. Updating EMPs

103. The EMPs for the Kampot and Kep subprojects will need to be updated during the pre-construction detailed design stage to ensure the EMPs meet the final detailed design requirements of the subprojects. This will involve finalization of the mitigation sub-plans to manage potential impact areas such erosion, sedimentation of surface waters, noise, dust and air quality, spoil disposal, traffic, and worker and public safety at the project sites. The impact mitigations of the pre-construction phase are detailed in the EMPs for the subprojects which are prepared under separate cover.

104. Key impact mitigation measures of the pre-construction phase are:

1) Initiation of the project's resettlement plan;
2) Groundwater and soils investigation at crab market;
3) Completion of detailed designs of the subprojects; and
4) Updating and initiation of the EMPs.

105. Updating the EMPs also involves updating the environmental baseline descriptions of affected areas where needed to better understand potential impacts of subprojects and to maximize their effectiveness.

ii. Construction Phase

a. Common potential impacts of subprojects

106. The potential environmental impacts of the subprojects in Kampot and Kep are mainly the construction phase-disturbances of the individual subproject components. Common impacts of the civil works will consist of for example, reduced and/or blocked public access, disrupted business and recreation, noise, dust and air pollution from NOx, SOx, and CO caused by increased truck traffic and heavy equipment use, soil and surface water pollution caused by equipment operation and maintenance, public and worker accidents, increased traffic accidents, land erosion and surface water sedimentation, drainage and flooding problems, solid waste and domestic pollution from worker camps, communicable disease and community problems caused by migrant workers. These short-term impacts will occur at different levels of magnitude depending on the civil works activity and the subproject site.

b. Common mitigation measures

107. Management measures to mitigate potential common impacts associated with the construction phase of the infrastructure developments are presented below. The mitigation measures are detailed further in the EMPs.

a) Care must be taken to ensure that sites for earthworks (e.g., excavations, trenches) that are suspected to have unexploded ordnance (UXO) should be surveyed by the Government prior to construction. If such ordnance is detected clearing work will need to be commissioned prior to undertaking civil works.
b) Open excavations should be fenced, and trenches covered where public walkways or vehicles must cross.
c) A cultural chance find management plan must be in place for cultural artifacts and property.
d) Regular use of wetting agents should be employed at construction sites to minimize dust.
e) All construction vehicles and equipment should be maintained in proper working order, and not operated at night if possible to minimize noise.
f) Speed limits should be posted and adhered to by construction vehicles.
g) Where possible construction vehicles should use different roads or dedicated lanes of roads shared by the public.
h) Trees and other vegetation at all construction sites and along road corridors should be protected, and not removed from anywhere near Kep National Park.
i) Present and past land use should be reviewed to assess whether excavated soils are contaminated. Contaminated spoil should be disposed at the existing landfills for Kampot and Kep, or locations approved by DOE.
j) Berms and/or silt curtains should be constructed around all excavation/trench sites and along all surface waters to prevent soil erosion and surface water sedimentation.
k) Local workers should be used as much as possible to prevent or minimize influx of migrant workers, and incidence of social disease and community unrest.
l) Worker camps must have adequate domestic waste collection facilities and sufficient pit latrines that are located away from public areas and surface waters.
m) Dedicated fuel storage areas must be established away from public areas and marked clearly.

n) To minimize the impact of construction on the public and workers the recent Cambodia Occupational, Health, and Safety (OHS) Programme guidelines developed for Cambodia by the International Labour Organization (ILO) should be followed. The IFC World Bank Environment, Health, and Safety Guidelines (2007) cited above should be followed to supplement the OHS if necessary.
o) Aggregates (e.g., sand, gravel, rock) that are transported by truck should be covered.
p) Prolonged use of temporary storage piles should be avoided, or covered, or wetted regularly to prevent dust and erosion.
q) Sand extraction in rivers for road embankment fill should be done at licensed areas only.
r) Storage of bulk fuel should be on covered concrete pads away from the public and worker camp. Fuel storage areas and tanks must be clearly marked, protected and lighted. Contractors should be required to have an emergency plan to handle fuel and oil spillage.

Subproject-specific Construction Impacts and Mitigations

Passenger pier facility

Surface water quality

108. The construction of the passenger pier, associated buildings, and car park could cause siltation to the Teuk Chhou River which would degrade water quality and impede local uses of the river. The available data on suspended solids in the river (Table 5) indicate that ambient TSS levels are low. Aquatic biota of the river would also be negatively affected as would local fishing activities. Construction waste can also end up in the river. Extra care should be taken with the construction of temporary shoreline berms or placement of in situ silt curtains parallel to the shoreline to isolate construction areas as much as possible to protect the river. Silt curtains placed parallel to the shore (and current) can restrict siltation from civil works at the shoreline. Such curtains have been used in strong-current situations such as in the tidal area of Chai Bay for the Cai Lan Port in Quang Ninh, Viet Nam.

109. Construction of the pier and lateral embankments should occur during the dry season thereby reducing the exposure of the low-flow state of river to construction activities. Clearly defined management and rules for not disposing any construction waste into Teuk Chhou River should be developed and implemented by contractors.

110. Similarly, upgrades to the access road to the pier facility should occur during the dry season. Construction vehicle traffic should stay within the existing alignment as much as possible to prevent unnecessary lateral erosion where possible. Temporary berms or plastic fencing should be placed between the access road and the river to prevent erosion. Similar erosion barriers should be installed to protect salt farms and all other land uses along the access road.

111. To prevent the salt beds from being contaminated by the treated waste water coming from the ABR, the said effluent should pass through a culvert or PVC pipes connected to an artificial wetlands constructed at a far distance from the salt farms. The discharge effluent must meet standard of Cambodia.

Mangrove removal and restoration

112. Some of the mangroves that are scattered on the pier site east of the Teuk Chhou River will be removed for pier facilities, notwithstanding the design of the pier facility which includes a central mangrove interpretive area to demonstrate the importance of mangroves to the coastal ecosystem. The loss of these mangroves will be offset by the project support that will be given to the ongoing mangrove restoration activities of the Children and Women Development Centre (CWDC) that is occurring along the coast of Cambodia[21].

Road and river traffic disruption

113. The upgrades to the access road and construction of the pier will disrupt road and boat traffic and increase the risk of traffic accidents on both transportation routes. Careful review of existing traffic along each medium of transport will be conducted to develop a construction vehicles traffic management plan to ensure civil works and excavation equipment does not interfere with ongoing traffic flow. Special speed limits for all traffic should be posted and enforced in the river and along access road. Along-shore dedicated lanes for pier construction-related boat activity will be specified, and truck traffic lanes along access road will be specified where possible.

Crab market environmental improvements

Coastal zone and water quality

114. The civil works and construction activities of the urban improvements could cause soil erosion to the beach and coastal areas if not contained effectively. Such erosion would negatively affect water quality and inshore aquatic habitat. The excavations for the placement of ABR septic tanks should be conducted to ensure excavated soil is carried offsite to DOE-approved disposal areas. Piles of soil should not be left uncovered and wetted regularly to prevent erosion. Of particular concern is the inshore area adjacent to the crab market where crabs are stored in cages for the market. The beach and coastal areas should be physically separated from all civil works and construction activities with temporary berms or plastic fencing.

115. A potential significant issue with the ABR septic system is the availability of sufficient land and soil depth in the crab market area to allow complete passive treatment of waste by the gallery infiltration field-phase of the ABR system. The area required for the gallery infiltration field will need to be determined during detailed design phase when the soil type and permeability in the market area is assessed in light of the anticipated volume /day of wastewater that needs to be treated.

116. The infiltration gallery of the ABR must be located in a proper site that will not contaminate local groundwater, and local wells. As introduced above a study of the depth of the local water table, quality of groundwater, the location of domestic wells, and soil quality in the crab market area needs to be conducted at detailed design phase.

Disruption of Commercial Activity

[21] Sea Appendix B for activities of the CDWC and support from project

117. The upgrading the crab market will require merchants to either temporarily move or suspend their business activities. Compensation and entitlements are outlined in the resettlement plan.

Mangrove and Seagrass Habitat

118. There are mangrove forests and seagrass east of Kep town toward the eastern provincial boundary with Kampot. While the mangroves and seagrass should be distant enough from all urban improvement activities care should be taken to ensure that all civil works and construction activities avoid this critical coastal habitat.

a. All subproject components

Protected Areas, Rare and Endangered Species, and Cultural Property and Values

119. There are no known rare or endangered terrestrial wildlife species or critical habitat in the immediate vicinity of the subprojects in Kampot and Kep. As earlier mentioned in the previous section, the subprojects are not near the national parks of Bokor and Kep. Thus, the construction phase activities that are implemented along with specified mitigation measures should not negatively affect these sensitive ecosystem components.

120. Similarly, there no known rare or endangered marine or freshwater wildlife species, or critical habitat at the immediate passenger pier site on the east side of the Teuk Chhou river. The highly valued mangroves forests are located across the river on opposite riverbank. The rare or endangered marine wildlife including seagrass beds and conservation areas are located below the mouth of the Teuk Chhou River in near shore Kampong bay.

121. However, while the selected subproject sites are not expected to change, the precise and final locations of facilities and components of the subprojects will be determined at the detailed design phase. Thus, the potential exists for nearby valued ecological and cultural resources to be negatively affected should subproject locations and components be altered significantly at detailed design. Therefore, as part of the detailed design stage when subproject siting is finalized, and when the EMP is updated to meet the detailed designs, a review of the proximity and sensitivity of all valued eco-cultural resources of the subproject areas (e.g., seagrass beds, mangrove forests) in relation to finalized infrastructure developments should be undertaken.

ii. Operation Phase

Passenger Pier Facility and Access Road

Seagrass beds and mangrove forests

122. The operation of the new passenger pier for tourist boats combined with the present fishing boat and expected increased cargo boat activity in the Teuk Chhou River will result in an overall increase in boat traffic to and from the mouth of the river through the existing seagrass beds of inshore Kampong Bay. The increased boat traffic could damage the seagrass beds and mangrove forests that are located adjacent to the

existing scoured boat channel that extends out to deeper Kampong bay above the seagrass beds and away from the mangroves.

123. Potential damage or destruction would arise from:

a) the existing boat channel being widened due to greater number of boats trying to use channel, thereby destroying adjacent seagrass beds and mangroves;
b) larger boats using the passenger pier which necessitates channel dredging and widening;[22] and
c) increased inshore discharge of oil and gas and other waste from the greater number and size of boats using the passenger pier.

Water quality

124. The increased boat activity may negatively affect the water quality in the Teuk Chhou river and inshore Kampong bay from the potential associated increase in the discharge/spills of oil, gasoline, and solid waste from the boats. Water quality can also be degraded from solid and domestic liquid waste from tourist boats, and from the operation of pier facilities.

a. Aquatic biota, biodiversity, and rare and endangered species

125. The development of the passenger pier facility on the east bank of the Teuk Chhou river will cause the least ecological damage of the three alternative sites investigated (see Analysis of Alternatives below) because minimal critical habitat, i.e., mangrove forests and seagrass will be affected by the immediate footprint of the pier and associated facilities. However, there are potential indirect impacts of the pier facility.

126. The potential effects of degraded water quality, widened or new boat channels to/from the river, and the physical disturbance created by the increased boat traffic in the area could destroy and reduce the area of seagrass in the area. This would lead to a reduction in the biodiversity and the inshore and offshore fisheries that are dependent on this valuable habitat. The existing rare and endangered species that depend on seagrass will also be negatively affected.

127. The area of seagrass in near shore Kampong bay is so uniquely large, and therefore, extremely valuable habitat because the shallow inshore zone of the bay extends uncommonly far offshore exposing a great area to photo synthesis which produces the extensive seagrass bed. However, the shallowness of the area also makes the seagrass vulnerable to boat activity. Thus, there is a need to channel boats out to depths at which seagrass are not physically exposed.

128. There is a substantial literature on the damage boats and port activities inflict on seagrass beds or meadows. The damage from boats occurs from propeller scour, anchor chains, and permanent mooring installations, as well as from pollution. The potential `downstream_ impacts of the operation of the passenger pier facility on the well documented sensitive inshore area of Kampong Bay must be prevented and mitigated carefully.

[22] The depth of the channel ranges from approximately 2-3 meters at low water.

b. Boat and vehicle traffic safety

129. The increased traffic of boats in the Teuk Chhou river and vehicle traffic along the upgraded access road to the pier complex will increase the risk of traffic accidents for both transportation modes. Disturbance from noise will increase along both routes with an increase of noise and dust along the access road, and increased noise in the river.

c. Worker and public safety

130. The operation of the passenger pier facility will create a risk of worker and public safety injury caused by increased tourist traffic to/from of pier, and operation of pier facilities.

d. Impact mitigations

131. The mitigations for potential impacts of the passenger pier in operation are summarized below. The mitigations are elaborated in the EMP for Kampot province which in turn will be updated during the detailed design phase to meet the detailed designs of the passenger pier and facilities. Mitigations for potential impacts of the operation of the passenger pier facility are summarized as follows:

a) Posted and enforced speed limits along upgraded access road to pier by DPWT.
b) Posted and enforced speeds on the river by DPWT that recognizes the different boat size, and frequency of the users of the river (e.g., fishermen, cargo boats, tourist boats)
c) The solid and domestic waste management systems developed for the pier facility must be used properly, and maintained in good working order.
d) All oil and gas, and boat maintenance supplies and equipment must be stored in proper containers in locked dedicated buildings away from the river and land.
e) Boat maintenance should be conducted on land in dedicated boat maintenance buildings if appropriate. Boat maintenance on the river should be conducted to ensure waste solid and liquid wastes such as oil, gas and paint is not discharged to the river.
f) All boats that use the pier must be maintained in good working condition and inspected regularly.
g) A navigation system is needed to ensure tourist boats and all other boat traffic in/out of the Teuk Chhou river navigate in well-marked dedicated boat channels or lanes out of the river that that traverses the near shore seagrass beds in Kampong Bay.
h) The bathymetry of existing boat channel from the Teuk Chhou River into Kampong bay (
i) Figure 13) needs to be reviewed carefully to clarify the width and length of the channels in the river and out to Kampong bay.
j) The existing near shore boat channel out to Kampong Bay which supports, minimal seagrass due to propeller scour, is not expected to need dredging because the channel is used at all times of the year by the existing navy installation which is located upriver from pier site[23]

[23] Communication with Navy base, June 2013.

k) The location of seagrass beds and conservation areas along either side of the dedicated boat channels out into Kampongbay must be clearly market with floating signage.
l) All boat traffic must navigate within the dedicated channels, avoiding seagrass areas including the conservation area to the east of the channel and west of the channel into future seagrass conservation areas adjacent to the mangrove forests, along the coastline.
m) An enforced management plan is required that prevents discharge of solid and domestic waste from all boats into the river or Kampong Bay.

132. The twelve items listed above should be developed into a formal navigation management plan and procedures for the Teuk Chhou River¯Kampong bay area. The management plan must be developed collaboratively by marine resource management agencies (e.g., MAFF and MOE) and the agencies responsible for marine navigation and safety (e.g., DPWT, coast guard). All boat users of the river should be required to follow the plan.

2. Crab Market Environmental Improvements

a. ABR wastewater treatment system

Contamination of Environment and Community Impact

133. The ABR wastewater treatment system will provide a simple and potentially very effective technology for collecting, partially treating, and removing domestic waste from the crab market area. However, as indicated in the Analysis of Alternatives (section VII), the ABR system does not incorporate active waste treatment that is provided by conventional aerated lagoon-based plants or the high pressure treatment plant that were also considered but found unsuitable for the crab market.

134. The liquid phase of the wastewater that overflows the ABR tanks into the infiltration gallery is essentially raw sewage minus the solid phase which is left behind in the tank. Waste treatment of the ABR system relies on the post-ABR tank infiltration gallery to distribute the untreated liquid phase over a wide area to passively detoxify and become assimilated into the environment. Thus, the key attribute of the system is sufficient area for complete waste assimilation. The risk of using an ABR system is that the selected area for the gallery infiltration bed becomes too small, or worse, is too small at the outset due to the space constraints in the crab market area.

135. The crab market area could be exposed to periodic pollution events from sludge from the ABR tanks. This could arise if procedures to periodically pump the sludge from the ABR tanks into transport trucks for transport to the MOE-approved disposal site are not followed properly. Similarly, potential septage overflow events could occur if ABR tanks are not pumped out frequently enough.

Coastal and Well Water Quality

136. The ABR system and filtration gallery will underlie the parking area in the crab market where the liquid spillover phase of the ABR tanks will be distributed for assimilation into the environment. From above there is risk that over time, due to natural soil or slope

properties, or possibly as a result of activities on the overlain parking area, that the infiltration area could stop being able to completely assimilate the wastewater. For example, lateral leakage of the filtration gallery to the seashore of the crab market could occur, thereby degrading nearshore water quality, or contamination of groundwater and local well water supplies could develop. ABR tanks could become cracked and start leaking if the soils and foundations for the ABR tanks are not stable. Such leakage could also end up on the seashore and groundwater

137. Another risk of the ABR system is that it will not be maintained properly. The sludge from the ABR tanks must be removed regularly otherwise the system fails and aesthetic and human health pollution problems can be created. There is zero tolerance for large point source aesthetic pollution issues in the crab market tourist area.

138. Grease and fat must be intercepted before reaching the ABR tanks because those substances will clog and impeded the sorting and settling process in the tanks. It is thus proposed that grit, grease and oil traps are installed at each source. This arrangement might also form the basis for a tariff for periodic pickup and disposal of accumulated grease and oil by a private operator.

b. Mitigations

139. The soil depth, type, and permeability, slope, and slope stability of the parking area of the crab market needs to be assessed as part of the detailed design phase. This information is needed to determine the required area for the infiltration gallery that is needed to assimilate the expected volumes of waste that will be generated by the crab market area.

140. The ABR tanks must be emptied according to formal procedures, and maintained as required. The vehicles assigned to the collection and transport of the septage to the designated MOE-approved disposal site must be maintained operable. As indicated above a candidate septage disposal site for MOE approval at detailed design phase is the site that will be used for the sludge from the new ABR at the Kampot pier.

iii. Induced and Cumulative Impacts

141. The goal of increasing tourism and associated socioeconomic development in the towns of Kampot and Kepis linked to potential negative direct and indirect impacts on the valued environmental components, community, and cultural physical resources that are the underpinning assets of tourism development. Potential induced and cumulative impacts of the subprojects are important factors that should be considered carefully. Example mechanisms of induced or cumulative impacts are introduced briefly below for the subprojects.

142. An example potential directly induced impact of an increased number of tourists in Kep town is increased pollution from solid and domestic waste outside project areas. More tourists result in greater consumption of goods and resources which can put greater strain on key amenities such as the cleanliness of local beaches, shore road parks and promenades. An increase in the number of tourists in Kep could lead to social issues stemming from the interaction of local and foreign cultures.

143. Similarly, the objective to increase the number of tourists that travel to Kampot town could overload existing solid and domestic wastewater management facilities leading to increased pollution and social issues. Moreover, as introduced above, the creation of boat traffic to and from the passenger pier and the overall increase at the mouth of the river of the Teuk Chhou River and near shore Kampong bay if not strictly controlled will lead to further damage of the seagrass beds and mangrove forests of Kampong Bay. The loss of seagrass and mangrove habitat will negatively affect the inshore and offshore fisheries, and important rare and endangered species such as the mammal sea cow Dugondugon, and the green turtle Cheloniamydas. The coastal zone of the provinces of Kampot and Kep together with Sihanoukville and Koh Kong form part of the last remaining pristine coastal zones in Southeast Asia that extend from Thailand east to Kien Giang province in Viet Nam.

144. A potential indirect induced effect of tourism development which is very difficult to prevent is lateral independent commercial and urban development that develops to serve and benefit from the tourism created by the project. The passenger pier in Kampot for example could easily become the seed for much greater and non-sustainable growth in both tourism and urban development along the coastline and interior of Kampot. Indirect induced tourism-socioeconomic growth is usually broader geographically and more difficult to manage with respect to impacts on environmental resources because of the different parties and interests involved.

145. The realization of the above and other unforeseen induced impacts of the project will be monitored to determine the overall impact of the project in Cambodia. The monitoring plan for direct potential impacts of Outputs 1 and 2 will consider these broader ranging impacts, together with monitoring activities implemented for the capacity development and training under Output 3 and 4; and by ADB. Lessons from past ADB tourism support in Cambodia, such as the need to develop suitable O&M mechanisms and involve local people in monitoring have been considered and incorporated into project design.

iv. Climate Change

146. The design of the passenger pier facility in Kampot, and the designs of environmental improvements at the crab market at the feasibility stage are climate change resilient. The elevation of the passenger pier will be high enough to not be affected by flooding and storm surges. Similarly the ABR septic systems and infiltration fields will not be vulnerable to flooding and excessive runoff.

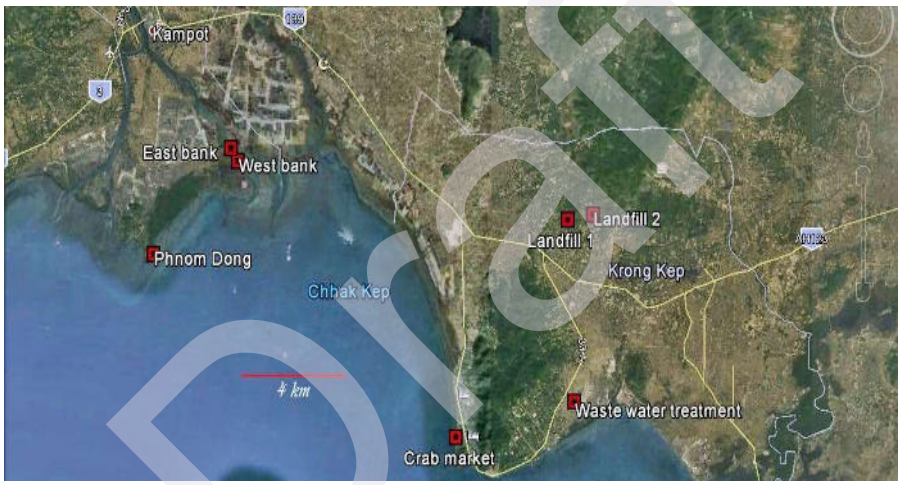
147. Conversely, the design of the passenger pier can also adapt to lower flows in the river resulting from reduced regional rainfall.

148. Consideration of climate change includes consideration of measures to reduce the contribution of the project to greenhouse gas production. Effort needs to be taken to reduce the carbon footprint of the project by ensuring that speed limits along the upgraded roads are enforced, and passenger and cargo boats that use the pier are maintained in good working order. All lighting installed at the passenger pier, along access roads, and in Kep town will use light bulbs that are energy efficient.

VII. ANALYSIS OF ALTERNATIVES

149. The initial selection of a long list of subprojects was conducted in accordance with the following criteria: (i) location in undeveloped segment of a GMS corridor; (ii) good tourism and economic development potential; (ii) investment has clear regional dimensions; (iv) existing tourism access and environmental infrastructure of SP is unable to cope with rapidly growing tourism or is constraining tourism growth; (v) Expected resettlement and environmental impacts of SP development are minor (i.e. Category B or lower) as summarized in REAs; (vi) Key stakeholders, including local authorities and local communities endorse the sub project development; and (vii) the indicative cost estimate is at least $3 million. An analysis of alternatives to the subprojects in Kampot and Kep further refined project selection, focusing on subproject siting and technologies. Figure 16 shows the alternate locations of the passenger pier in Kampot, and wastewater treatment in Kep.

Figure 16: Alternate Sites of Kampot Passenger Pier and Wastewater Treatment in Kep



b. Siting of Passenger Pier in Kampot

150. As discussed above, the coastal zone of Kampot province is a highly sensitive and valued ecosystem due to the extensive mangrove forests along the entire shoreline and the massive seagrass beds located in the near shore Kampong bay. These comparatively pristine critical habitats support rare and endangered wildlife, and inshore and offshore fisheries.

151. The extensive examination of three alternative sites for the passenger pier facility concluded with the selection of the east bank of the Teuk Chhou River which would cause the least immediate environmental impact. The summary assessment is provided below.

Results of Alternate Pier Sites:

Phnom Dong Headland: Category A due extensive seagrass destruction: disqualified

West Bank of Teuk Chhou River: Category A due to extensive mangroves destruction, andadjacent Community Fishing Mangrove Restoration Project: disqualified

East Bank of Teuk Chhou river: Category B because no direct (impact footprint) damage to seagrass or mangroves, and set alongside existing boat channel: preferred location for pier.

i. Phnom Dong Headland

152. The extent and proximity of seagrass beds to the site as shown (Figure 11, Fig 13 and figure 14) confirmed published studies that any form of pier/wharf/causeway development would occur on top of seagrass beds, moving the subproject to a Category A condition. Moreover, if a full EIA was conducted the site would be rejected due to investigation and validation of the following issues, along with assertions of the Director of the Fisheries Authority Kampot province.

a) The seagrass beds are used as feeding and spawning habitat for rare and endangered species such as the sea cow Dugong dugonga marine mammal, and green turtle Cheloniamydas
b) Cumulative impacts with the recent loss (before 2005) of 2,000 ha of seagrass in the intertidal zone on western edge of seagrass bed as a result of Vinh Hoi international port project west of Kampot;
c) Fisheries Authority, Agriculture, and Forestry Departments of Kampot were strongly against development here as indicated in a previous MOE EIA;
d) A seagrass conservation area has been established on east side of Teuk Chhou river channel with proposed conservation areas east to Phnom Dong site; and
e) The intrinsic and economic value of the seagrass beds to the inshore and offshore fisheries of Cambodia.
f) Seagrass and mangroves in Kampongbay generate USD $1,500./ha/yr and USD $1,200./ha/yr, respectively to the inshore and offshore fisheries of Cambodia.

153. Thus, the Phnom Dong headland site was excluded due to unavoidable extensive environmental and economic damage.

ii. Teuk Chhou River

154. A Teuk Chhou River bank location close to the river mouth was preferred because there are no seagrass beds in the river, and no seagrass beds in the existing boat channel as a result of years of propeller scouring. The Director of the Fisheries Authority of Kampot also prefers the river location, and identified the following benefits of the location:

a) Possible channel dredging[24] would benefit: a) fisherman; and b) cargo transporters by allowing year-round and 24 hr access to their up-river moorings and ports;
b) Passenger pier would be good for tourism; and
c) Possible dredging will support Government policy on seasonal flood control by allowing flood waters from the upper basin to flush out of the river faster.

[24] The subproject does not require dredging and will not dredge the river.

155. However, mangroves exist on both banks of the river, but with the east and west bank sites differing significantly in mangrove area and density. Because the Teuk Chhou River is near the large coastal seagrass bed development of a pier on either bank will require firm mitigations in the EMP such as:

a) All mangroves damaged or lost on riverbank will be replaced with local replanting as has been extensively done by AusAid at the mouth of the river;

b) The planned expansion of demarcated (signed) conservation zones in the seagrass bed between the river and Phnom Dong continue; and

c) Boat size restrictions are applied to pier to not overload river ecosystem, though the river will likely limit boat draft size naturally.

a. West bank of Teuk Chhou River

156. This site will require an estimated 2.4 km of road new road construction to the estimated 4 ha site where the pier and facilities were proposed. An area of patchy and dense mangroves equivalent to the footprint of the road and pier facilities would need to be cleared. The location of the road, as indicated by DOT, during the site visit will be constructed alongside a community fishing mangrove restoration project. This site was rejected due expected mangrove destruction and proximity to a conservation area.

b. East bank of Teuk Chhou River

157. The second of two east bank sites were chosen because government land was available, and because no mangroves line the shoreline after being cut down before 2005. Scattered mangroves exist inland of the river. The site is also recommended by the Director of the local Fisheries Association

158. The no-project alternative would result in no active tourist development in the Kampot area. Tourism development would occur in Kampot but indirectly with the pace of other tourist areas in the province and coastal region.

c. Wastewater Treatment Technology for Crab Market

159. Three technologies and three sites for the treatment of wastewater from the crab market area were investigated.

d. Lagoon-based WWTP - East of Kep

160. The first technology was an aerated-lagoon based WWTP that would be located on salt flats east of the centre of Kep town close to the seashore Wastewater would be collected from the crab market and piped to the WWTP. Treated effluent would be discharged to Kampong bay south of the WWTP.

161. This wastewater treatment solution was excluded because (i) there is not a reticulated water supply in Kep, (ii) the density of wastewater production in the area of the WWTP was too low, and (iii) because land transfer for the WWTP was going to be complex including compensation and resettlement.

e. Lagoon-based WWTP near Crab Market

162. A variant of the original plan was to develop a lagoon-based WWTP between the crab market and the string of beach front hotels and treat only wastewater from the hotels and crab market area. This plan was excluded due to the lack of available land for the WWTP because of the shoreline and road development plan of the municipality.

d. High Pressure Treatment Plant at Crab Market

163. The third option was to construct a Sequenced Batch Reactor WWTP and locate it on in-filled (reclaimed) shoreline beside the public washrooms next to the crab market. The technology was chosen because very little space was required, individual point sources could be linked to it, and the technology produced a high quality effluent which would be discharged below low tide mark without environmental damage. The alternative was discarded because of the need for in-filled shoreline which would have moved the subproject to a Category A condition,[25]and because of the relatively high expense, and low capacity of the local authorities to operate and maintain the facility.

iii. ABR Septic System at Crab Market

164. The current plan for wastewater treatment in the crab market is to install an Anaerobic Baffled Reactor (ABR) septic tank and filtration field system to treat only waste from the crab market and adjacent restaurant stalls. Unlike the first three alternatives, the ABR system does not use an active wastewater treatment process.

165. Similar to the common septic tank-infiltration field systems used throughout the world, treatment of the liquid phase that overflows the ABR tank relies on the gallery or field infiltration bed to distribute the untreated liquid phase over a wide area to passively detoxify and become assimilated into the environment. Thus, the key attribute of the system is sufficient area and appropriate soils for complete passive waste assimilation with the environment.

166. As discussed above the potential issues with the ABR technology concerns sufficient available land in crab market area being available for the infiltration bed, and the need for the detoxifying waste in the infiltration bed not coming in contact with groundwater and local domestic wells. Thus, it is recommended that an analysis be conducted during the detailed design phase of soil type and depth in the crab market area, and available area for the infiltration bed in relation to the expected volume of wastewater that will be produced by the crab market and adjacent restaurant stalls.

167. The no-project alternative would result in continued worsening of pollution problems at the crab market area as a result of inadequate solid and domestic waste management, which would lead to increased health problems of the local population and tourists, and the long term, a decrease in tourism activity at the site.

[25] Coastal zone infilling (reclamation) normally is a Category A condition because of the unknown aquatic resources that will be destroyed at the infilled area, and uncertainty of the quality of the fill, and potential contamination of nearshore area.

Other Project Related Environmental Concerns

168. This IEIA report has extensive coverage and has a general description of the procedures and measures in addressing the anticipated environmental impacts of the sub-projects. However, as part of the whole process of probing further the identified potential environmental consequences, the following concerns have to be considered in the detailed designing and planning of infrastructures as well as in the actual construction and operation phases of the sub-projects:

a) Climate Change Impact: The data on rainfall pattern, temperature fluctuations and occurrence of storms in Kampot and Kep were examined as presented in this IEIA document. This was substantiated by field validation from local authorities as regards to changes in sea tide and movements overtime. The intention is to determine the extent of the coastline margin increase inward as means to infer the possible occurrence of storm surge as well as sea level rise due to global climate change in the future.

b) Soil Formation: While this IEIA document mentioned about the project areas˘ soil structure and composition as mainly of silt and alluvium sediments, the origin and age of soil formation in the sites need also to be examined. This is to determine the appropriate structural design and extent of fill-in materials that will be required to build the foundation of the Kampot pier later as well as to prevent caving-in and earth surface slippage. Likewise, it is important to relate soil structure/composition with degree of permeability and porosity in order to address the probable leaching of the underground water source by the waste water and septage treatment during the operation phase.

c) Status of Underground Water. To ensure that the aquifers would not be damaged by excessive extraction of underground water, it is important to know the current source and extent of irrigation and potable water use by the households in both project sites. Any disorder on the aquifers may result to salt water intrusion or contamination of the water table by the septic and waste water treating operation. On the issue of low water table which makes it difficult to avail of a steady and sufficient supply for the ABR operation, rainwater harvesting and domestic water recycling should be part of the mitigating measure.

d) Waste Water Recovery. This IEIA document does not explicitly mention how the treated waste water can be recycled for added value use. Thus, it is interesting to further explore how it can be tapped for other purposes instead of just draining it to the ground and down to the sea.

e) Solid Waste Management. Since the sub-projects have much concern on how to address the growing problem of both solid waste and sewage accumulation, it is therefore necessary to know and understand the current status of waste management practices in both sites. The aim is to explore the prospects of adopting Integrated Community-Based Waste Management System in support to the main goal of the sub-projects in both Kampot and Kep.

f) Green Space and Ground Landscaping. To enhance the aesthetic value of the sites, greening, landscaping and specifically, establishment of forest parks in empty spaces both at the pier area and Crab Market premises must be considered in the EMP. This does not only intend to beautify, but also to provide protective buffer strips to regulate

temperature, wind flow as well as filter any foul odor resulting from the septage and waste water treatments later on. Further, it will contribute to carbon sequestration, thus, helping reduce GHG from the atmosphere.

VIII. INFORMATION DISCLOSURE AND GRIEVANCE REDRESS MECHANISM

169. As indicated above the subproject components were introduced to stakeholders during project preparation, including verbal and visual presentations of all subprojects elements.

170. The IEIA must be easily available to the stakeholders contacted during project preparation, in written and verbal forms, and in local language. At a minimum the Executive Summary of the IEIA should be translated to Khmer and distributed to all APs. The IEIA should be available on the MOT and DOT web sites, at DOT offices, district offices, and subproject sites. Similarly, all project reporting with specific reference to stakeholder consultation minutes, environmental monitoring, and reports on EMP implementation released by the EA/PCU should be available at the same offices and web sites. The IEIA will also be available on the ADB web site. And after implementation of subprojects begins, all environmental and EMP reporting submitted by the EA/PCU will also be available on the project and ADB web site.

171. A well-defined grievance redress and resolution mechanism will be established to address all affected stakeholders lodge grievances and complaints regarding environment, land acquisition, and compensation and resettlement, in a timely and satisfactory manner. All stakeholders will be made fully aware of their rights, and the detailed procedures for filing grievances and an appeal process will be published through an effective public information campaign. The grievance redress mechanism and appeal procedures will also be explained in a project information booklet (PIB) that will be distributed to all stakeholders.

172. APs are entitled to lodge complaints regarding any perceived issue with the affected environment, or aspect of the land acquisition and resettlement requirements such as entitlements, rates and payment and procedures for resettlement and income restoration programs. APs complaints can be made verbally or in written form. In the case of verbal complaints, the committee on grievance will be responsible to make a written record during the first meeting with the APs.

173. A Grievance Committee that has experience with environmental and social issues will be organized in local communes, comprising local leaders designated for such tasks. The designated commune officials shall exercise all efforts to settle issues at the commune level through appropriate community consultation. All meetings shall be recorded by the Grievance Committee and copies of meeting minutes shall be provided to affected persons. A copy of the minutes of meetings and actions undertaken shall also be provided to the DOT, PIU, and ADB upon request.

174. The procedures for environmental and social grievance redress are set out below. The procedure described below is consistent with the legal process for resolution of disputes in Cambodia.

a) Stage 1: Complaints from APs for the first time shall be lodged verbally or in written form with the village head or commune leader. The complaints shall be discussed with the APs and the designated Head of Grievance Committee or members of the committee. Because initial environmental issues will most likely be construction-related the Environment Officer/contractor and Safeguards Specialist/PIU need to be notified immediately. It will be the responsibility of the Head of Grievance Committee to resolve the issue within 15 days from the date the complaint is received. All meetings shall be recorded and copies of the minutes of meetings will be provided to APs.

b) Stage 2: If no understanding or amicable solution can be reached or if no response is received from the Grievance Committee within 15 days from filing the complaint, the APs can elevate the case to the District Grievance Committee. The District Grievance Committee is expected to respond within 15 days upon receiving the APs appeal.

c) Stage 3: If the AP is not satisfied with the decision of the District Office, or in the absence of any response, the APs can appeal to the Provincial Grievance Committee (PGC). The PGC will review and issue a decision on the appeal within 30 days from the day the complaint is received.

d) Stage 4: If the AP is still not satisfied with the decision of the PGC or in the absence of any response within the stipulated time, the APs, as a last resort may submit his/her case to the provincial court. The court will address the appeal by written decision and submit copies to the respective entities which include the DOT, DGC/PGC and the APs. If however, the AP is still not satisfied the court's decision, the case may be elevated to the provincial court. If however, the decision of the provincial court is still unsatisfactory to the APs, the APs may bring the complaints to the Higher Court.

175. The PCU will be responsible for checking the procedures and resolutions of grievances and complaints. The sustainability and monitoring coordination unit of the PCU must have expertise and experience in social and environmental issues associated with infrastructure developments. The PCU may recommend further measures to be taken to redress unresolved grievances. The environmental specialists of the DDSC will provide the necessary training to improve grievance procedures and strategy for the grievance committee members when required.

176. The executing agency will shoulder all administrative and legal fees that will be incurred in the resolution of grievances and complaints if the APs win their case. Other costs incurred by legitimate complaints will also be refunded by the project if the APs win their case.

177. In cases where APs do not have the writing skills or are unable to express their grievances verbally, APs are encouraged to seek assistance from the recognized local groups, NGOs, other family members, village heads, or community chiefs to have their grievances recorded in writing and to have access other documentation, and to any survey or valuation of assets, to ensure that where disputes do occur, all the details have been recorded accurately enabling all parties to be treated fairly. Throughout the grievance redress process, the responsible committee will ensure that the concerned APs are provided with copies of complaints and decisions or resolutions reached.

178. If efforts to resolve disputes using the grievance procedures remain unresolved or are unsatisfactory, APs have the right to directly discuss their concerns or problems with ADB's Southeast Asia Department through the ADB Cambodia Resident Mission (CARM). If APs are still not satisfied with the responses of CARM and the Southeast Asia Department, they can directly contact the ADB Office of the Special Project Facilitator (OSPF).

IX. ENVIRONMENTAL MANAGEMENT PLANS

179. Environmental management plans for the subprojects in Kampot province and Kep province have been developed, and are under separate cover.

X. CONCLUSIONS AND GENERAL RECOMMENDATIONS

180. The examination of the subprojects of the project in Cambodia indicates that potential environmental impacts are largely restricted to the construction phase of the subproject components. The construction-related disturbance and impacts of elevated dust, noise, traffic disruptions, erosion and sedimentation, disrupted commercial and community activities, and public and worker safety can be managed and mitigated effectively with standard construction practices (e.g., IFC/World Bank 2007).

181. The stakeholder meetings and household and village level interviews underscored the need for effective management of noise, dust, traffic disruptions, and safety during the construction phase of the project. Follow-up meetings with the consulted stakeholders to address any construction-related issues are required.

182. However, potential significant impacts of the operation of the passenger pier in Kampot on the coastal resources and critical habitat could occur immediately and over time. The most sensitive critical habitats are the offshore seagrass beds and adjacent mangrove forests. Mitigations of potential environmental impacts of the pier in operation must be strictly followed. It is strongly recommended that a formal navigation management plan be developed for all boat traffic in the Teuk Chhou river and near shore Kampong bay.

183. A potentially significant issue with the operation ABR septic system at the crab market in Kep is the immediate and long-term sustainability of the waste treatment technology due to the requirements for sufficient land area for the passive treatment of the liquid phase through the infiltration gallery bed. Should the infiltration gallery bed become too small then unassimilated wastewater could leak laterally to the shoreline thereby degrading coastal water quality, or into groundwater and local domestic wells.

184. The detailed design phase of the subproject must carefully assess the land area requirements for the infiltration phase of the ABR system in view of local soil type and depth, and wastewater volumes to be treated.

185. In parallel with preparation of the detailed designs a select re-review of the existence and sensitivity of valued coastal ecological and cultural resources including groundwater is needed to clarify potential impacts of the detailed designs. It is recommended that as part of the update of the EMPs at the detailed design stage, that supplementary data/information be reviewed. A local groundwater and soils investigation at the Kep market is required

186. The IEIA concludes that the description of the feasibility design of the project combined with available information on the affected environment is sufficient to identify the scope of potential environmental impacts of the project. Providing that significant changes do not occur to the design of one or more of the project components, and that the supplementary sensitive receptor data, and final design information identified above is provided that further detailed environmental impact assessment (EIA) of the project is not required. IEIA and EMPs will be updated and finalized at the detailed design stage which will be sent to MOE for assessment and comments.

187. The separate EMPs developed for the provincial subprojects provide impact mitigation plans, environmental monitoring plans, and specify the institutional responsibilities and capacity needs for the environmental management of the subprojects. The IEIA recommends that the EMPs be reviewed and updated at the detailed design phase to ensure that they address fully the final project designs, and all potential environmental impacts of the subprojects.

XI. SPECIFIC RECOMMENDATIONS ON ENGINEERING WORKS AND DESIGNING

188. Based on the findings of the Executing Agency's (EA) consultants' field assessment on both subprojects in Kampot and Kep on April 27-29, 2016, the following additional recommendations were drawn:

a) Elevate the concrete foundation of the pier to at least 2 meters high for long term run to give allowance to probable sea level rise resulting from the worsening global climate change phenomenon,

b) Use huge, concrete and massive piles, along with quality fill-in materials in establishing a climate resilient concrete foundation of the Kampot pier.

c) Monitor regularly the quality of underground water to ensure that no trace of coliform or any kind of micro-organism that will permeate and contaminate the water table.

d) Establish tree parks in the empty spaces as aesthetics, wind breakers and heat regulator. Broad leaves tree species with deep rooting system can best serve as vegetative cover for the watershed and a buffer strip against strong winds. They also contribute to reducing Green House Gas (GHG) emission, being good carbon sink,

e) There should be massive mangrove reforestation along the shallow brackish water area within the mouth and at the east bank of the Teuk Chhou river. This is to establish a good spawning ground for fish and other marine resources, as well as provide protection from probable storm surge resulting from global climate change in the future,

f) Integrated Solid Waste Management practice should be adopted in the entire community. Aside from the trash cans and garbage bins being provided to contain solid waste matters from the crab market, there should be proper and systematic waste collection, segregation and recycling. To make it as a permanent value for all, there should be continuous information campaign and

public education, to include the inclusion of the subject matter to the curriculum of school children. Likewise, tourists and visitors should strictly observe proper solid waste disposal in public areas. Penalty should be imposed to violators,

g) As a strategy to make proper waste management sustainable, there should be an incentive build into the practice. The private sector should invest in waste recycling and processing units so that the public, particularly the rural poor can be motivated to get involved in collecting, selling and recycling solid waste materials as means to augment their income. In return, the private investors should be given tax exemption or rebates as an incentive,

h) Elevate and renovate Crab Market restaurants at least 2 meters higher in elevation than the ABR facility to ensure stronger gravitational flows.

i) Construct and improve the drainage system of both pier and crab market area. To minimize, if not avoid the constant occurrence of flush floods caused by run-off water coming from the higher areas during the peak of raining season, there should be more outlets with wider channels that directly drain to sea.

j) Construct artificial wetlands to contain treated waste water. Since the current sub-project is spending in treating waste water from both Kampot pier and Kep crab market/ restaurants, there should be value added use of the recycled water. The construction of artificial wetlands that could turn into ponds for phytoremediating plants and flowering lilies/lotus can add aesthetic value to the site, particularly in Kampot Pier. Such constructed wetlands can also be used for water sporting or floating restaurants/casino. At same time, the soil being removed to construct the pond can be used as fill-in materials to elevate the foundation of the pier.

k) Recycle treated waste water can also be used for garden. Since there is limited surface water for rice production in the area, treated waste water from both Kampot pier and Kep crab market could be used for irrigation or vegetable gardening . However, the most possible use of the treated recycled waste water would be for maintaining the tree parks and the immediate green landscape of the area for aesthetic purposes. By doing so, there will be no more concern for possible contamination of the water table by waste water and treated sewage with the construction of artificial wetlands, as well as by utilizing the latter for irrigation purpose.

XII. REFERENCES CITED

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APPENDIX A. ENVIRONMENTAL STANDARDS FOR CAMBODIA

From Government Sub-decree on Water Pollution Control (1999)

Annex 1: Effluent Standard for pollution sources

Effluent standard for pollution sources
discharging wastewater to public water areas or sewer

Nº	Parameters	Unit	Allowable limits for pollutant substance discharging to	
			Protected public water area	Public water area and sewer
1	Temperature	^0C	< 45	< 45
2	pH		6 – 9	5 - 9
3	BOD_5 (5 days at 200 C)	mg/l	< 30	< 80
4	COD	mg/l	< 50	< 100
5	Total Suspended Solids	mg/l	< 50	< 80
6	Total Dissolved Solids	mg/l	< 1000	< 2000
7	Grease and Oil	mg/l	< 5.0	< 15
8	Detergents	mg/l	< 5.0	< 15
9	Phenols	mg/l	< 0.1	< 1.2
10	Nitrate (NO_3)	mg/l	< 10	< 20
11	Chlorine (free)	mg/l	< 1.0	< 2.0
12	Chloride (ion)	mg/l	< 500	< 700
13	Sulphate (as SO_4)	mg/l	< 300	< 500
14	Sulphide (as Sulphur)	mg/l	< 0.2	< 1.0
15	Phosphate (PO_4)	mg/l	< 3.0	< 6.0
16	Cyanide (CN)	mg/l	< 0.2	< 1.5
17	Barium (Ba)	mg/l	< 4.0	< 7.0
18	Arsenic (As)	mg/l	< 0.10	< 1.0
19	Tin (Sn)	mg/l	< 2.0	< 8.0

20	Iron (Fe)	mg/l	< 1.0	< 20
21	Boron (B)	mg/l	< 1.0	< 5.0
22	Manganese (Mn)	mg/l	< 1.0	< 5.0
23	Cadmium (Cd)	mg/l	< 0.1	< 0.5
24	Chromium (Cr)$^{+3}$	mg/l	< 0.2	< 1.0
25	Chromium (Cr)$^{+6}$	mg/l	< 0.05	< 0.5
26	Copper (Cu)	mg/l	< 0.2	< 1.0
27	Lead (Pb)	mg/l	< 0.1	< 1.0
28	Mercury (Hg)	mg/l	< 0.002	< 0.05
29	Nickel (Ni)	mg/l	< 0.2	< 1.0
30	Selenium (Se)	mg/l	< 0.05	< 0.5
31	Silver (Ag)	mg/l	< 0.1	< 0.5
32	Zinc (Zn)	mg/l	< 1.0	< 3.0
33	Molybdenum (Mo)	mg/l	< 0.1	< 1.0
34	Ammonia (NH_3)	mg/l	< 5.0	< 7.0
35	DO	mg/l	>2.0	>1.0
36	Polychlorinated Byphemyl	mg/l	<0.003	<0.003
37	Calcium	mg/l	<150	<200
38	Magnesium	mg/l	<150	<200
39	Carbon tetrachloride	mg/l	<3	<3
40	Hexachloro benzene	mg/l	<2	<2
41	DTT	mg/l	<1.3	<1.3
42	Endrin	mg/l	<0.01	<0.01
43	Dieldrin	mg/l	<0.01	<0.01
44	Aldrin	mg/l	<0.01	<0.01
45	Isodrin	mg/l	<0.01	<0.01
46	Perchloro ethylene	mg/l	<2.5	<2.5
47	Hexachloro butadiene	mg/l	<3	<3
48	Chloroform	mg/l	<1	<1
49	1,2 Dichloro ethylene	mg/l	<2.5	<2.5

Annex 2: Water Quality Standard in Public Water Areas

Water Quality Standard in public water areas for bio-diversity conservation

1- River

No	Parameter	Unit	Standard Value
1	pH	mg/l	6.5 – 8.5
2	BOD_5	mg/l	1 – 10
3	Suspended Solid	mg/l	25 – 100
4	Dissolved Oxygen	mg/l	2.0 - 7.5
5	Coliform	MPN/100ml	< 5000

2- Lakes and Reservoirs

No	Parameter	Unit	Standard Value
1	pH	mg/l	6.5 – 8.5
2	COD	mg/l	1 – 8
3	Suspended Solid	mg/l	1 – 15
4	Dissolved Oxygen	mg/l	2.0 - 7.5
5	Coliform	MPN/100ml	< 1000
6	Total Nitrogen	mg/l	1.0 – 0.6
7	Total Phosphorus	mg/l	0.005 – 0.05

3- Coastal water

No	Parameter	Unit	Standard Value
1	pH	mg/l	7.0 – 8.3
2	COD	mg/l	2 – 8
4	Dissolved Oxygen	mg/l	2 - 7.5
5	Coliform	MPN/100ml	< 1000
5	Oil content	mg/l	0
6	Total Nitrogen	mg/l	1– 1.0
7	Total Phosphorus	mg/l	0.02 – 0.09

Annex 3: Water Quality Standard in Public Water Areas

Water Quality Standard in public water areas
for public health protection

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No	Parameter	Unit	Standard Value
1	Carbon tetrachloride	µg/l	< 12
2	Hexachloro-benzene	µg/l	< 0.03
3	DDT	µg/l	< 10
4	Endrin	µg/l	< 0.01
5	Diedrin	µg/l	< 0.01
6	Aldrin	µg/l	< 0.005
7	Isodrin	µg/l	< 0.005
8	Perchloroethylene	µg/l	< 10
9	Hexachlorobutadiene	µg/l	< 0.1
10	Chloroform	µg/l	< 12
11	1,2 Trichloroethylene	µg/l	< 10
12	Trichloroethylene	µg/l	< 10
13	Trichlorobenzene	µg/l	< 0.4
14	Hexachloroethylene	µg/l	< 0.05
15	Benzene	µg/l	< 10
16	Tetrachloroethylene	µg/l	< 10
17	Cadmium	µg/l	< 1
18	Total mercury	µg/l	< 0.5
19	Organic mercury	µg/l	0
20	Lead	µg/l	< 10
21	Chromium, valent 6	µg/l	< 50
22	Arsenic	µg/l	< 10
23	Selenium	µg/l	< 10
24	Polychlorobiohenyl	µg/l	0
25	Cyanide	µg/l	< 0.005

Appendix B: Mangrove restoration with CWDC Cambodia

Minutes of Meeting with Children and Women Development Centre (CWDC) Cambodia

Kampot, Cambodia
November 15, 2013

Participants:
Mr. PhouTeng, Vice Director, CWDC
Mr. Steven Schipani, ADB
Mr. Ricky Barba, ADB
Dr. J. Don Meisner, GHD

Purpose of Meeting:
Introduce Mr. Teng to the project and Kampot Pier subproject and obtain his input on how to manage issues with mangroves based on his recent article[26](12/11/13) on status of mangrove forests in Cambodia in the Phnom Penh Post

- SS introduced subprojects in Kampot and Kep with special reference to the passenger pier development in Kampot
- Mr. Teng followed with an overview of the mission and activities of the CWDC:
  - mission of CWDC is to establish a natural right of the community, vis-¯-vis children and women, to conserve and to manage the marine resources of Cambodia with a special focus on mangroves and inshore fisheries; and
  - activity areas of CWDC include: 1) education and awareness-raising of community; 2) development of rights of children and women¯s food security; and 3) conservation of natural resources.
- The development of the right to food security is occurring with the following activities:
  - creation of community-based fisheries;
  - mangrove protection and restoration, and
  - seagrass protection and conservation.
- CWDC through small ecotourism-based projects CWDC is promoting the importance of coastal resources all along coastline of Cambodia with the following example activities:
  - Kayaking through mangroves forests and seagrass beds
  - night fishing, and
  - awareness raising and capacity development
- CWDC is developing artificial reefs and habitat for inshore fish populations with spent concrete structures
- CWDC is also helping develop small ¯enterprises, for example community fish trading with fisherman, selling fish to or at local markets.
- CWDC is replanting mangroves along coastline using community-based mangrove nurseries. They get small financial support from different sources
- Mr. Teng was interested the pier development, and most importantly, that we plan to create a mangrove interpretive demonstration on site to create awareness of mangroves for tourists using the passenger pier.

[26] Phnom Penh Post November 12, 2013

¿ SS confirmed that the ADB project will seek to engage CWDC to contribute to the demonstration, but more importantly, to CWDC's ongoing mangrove restoration and small enterprise support work along the Cambodian coast.

Minute on Second Mission Report
On Presentation of Findings to Stakeholders

July 2016

Based on recommendation made by International consultant with Approval by VICA, the National Environment Specialist visited and presented the findings during first mission in April 2016 (in attachment) to consult with relevant stakeholders in Kep and Kampot provinces. The presentation/meeting was separated by province. The main purpose of the presentation is to share environmental findings with recommendation to relevant stakeholders for improvement and agreement. Three main topics including project background and location, Project Development and Issues, and Environmental Recommendations are presented. The process of the meeting was described in following:

I. Project Background and location

ð Two sub-projects of the GMS Tourism Infrastructure for Inclusive Growth for Cambodia are subjected to IEIA because they fall under ADB Category B for environmental and Social Safeguards.
ð Kampot sub-project is construction of pier that connects Cambodia coastal zone to Phu Quoc Island, Vietnam, to include immigration and customs office and support tourism faciities
ð Kep Crab Market involves the improvement of environmental services in cross border tourism centers,
ð Both sub-projects requires the construction of waste water treatment facilities and septage treatment facilities and other site improvements.

II. Project Development and Issues

2.1. Kampot Pier Development
2.1.1. Issues

Current issues for Kampot Pier Development: Absence of a strategic connecting gateway between Phu Quoc Island, Viet Nam and Cambodia's coastal zone with good infrastructures and adequate facilities of international standard that can further attract both local and foreign tourists and visitors.

2.1.2. Potential Issues Associated with the Sub-project

1. During the ground clearing and establishment, there will be earth scrapping, crushing and moving operations that will result to soil erosion and sedimentation, dust pollution, creating temporary disturbance in the immediate environment

2. Solid waste and liquid effluents˘disposal problem
3. Workers safety and protection during the construction phase will be t risk
4. Soil erosion and run-off water during rainy season if there will be no proper cover of the ground after land clearing

5. Falling debris from construction structures may contribute to the risk
6. Threatens biodiversity (sensitive habitat) and natural ecosystem during the operation phase
7. Increased solid and domestic waste accumulation resulting from the growing number of tourists and visitors transiting through the pier later, and Possible occurrence of storm surge and sea level rise as a result of global climate change in the future

2.1.3. Planned Interventions:

1. Upgrade the existing 6.5 km laterite access road to a concrete surface
2. Construct river bank stabilization, internal access roads, and a passenger landing area of approximately 1,500m^2
3. Construct a pier suitable for tidal and flood level fluctuation
4. Construct a passenger arrival/departure hall with customs/immigration offices, administration and ticket offices, landscaped tourist reception/information center and public toilets (totaling about 2,500m^2)
5. Construct a parking area (2,000m^2) and adjacent kiosks for food, beverage and souvenir vendors (750m^2)
6. Install power supply and lighting systems to all internal and external public areas,
7. Planned Interventions:
8. Upgrade the existing 6.5 km laterite access road to a concrete surface
9. Construct river bank stabilization, internal access roads, and a passenger landing area of approximately 1,500m2
10. Construct a pier suitable for tidal and flood level fluctuation
11. Construct a passenger arrival/departure hall with customs/immigration offices, administration and ticket offices, landscaped tourist reception/information center and public toilets (totaling about 2,500m2)
12. Construct a parking area (2,000m2) and adjacent kiosks for food, beverage and souvenir vendors (750m2)
13. Install power supply and lighting systems to all internal and external public areas,

2.2. Kep Crab Market Environmental Improvements

2.2.1. Current Key Issue:

No waste water treatment and integrated solid waste management, which causes pollution along the foreshore, threatening the health and well-being of local residents and tourists, thus, decreasing tourism value of the area.

2.2.2. Potential Specific Issues:

1. No proper waste disposal system: solid and waste water as well as human sewage are directly dumped into the sea

2. Unhygienic or unsanitary
3. Causes organic eutrophication or presence of coliforms resulting to gastrointestinal ailment
4. High congestion due to limited space within the market area,
5. Construction risk, disruption, pollution, waste accumulation, inconvenience and disturbance to the immediate environment during the equipment installation phase,
6. Safety and protection of workers during the construction phase,
7. Possible leakage of unassimilated waste water during the operation phase if infiltration area becomes too limited for increasing volume of liquid residue to be treated overtime,
8. Possible contamination of local ground and surface water by the whole waste water treating system if the cells of the treatment pits of the STF penetrate or are set too close to the water table, and
9. What to do with the treated waste water?

2.2.3. Planned Interventions:

1. Install a series of an aerobic baffle reactor tanks (ABR) and connect the toilets and sinks of shops and restaurants in the crab market to these units,
2. Expand the crab market structure in the adjacent dry goods area,
3. Pave existing parking lot,
4. Install additional public toilets,
5. Upgrade existing waste management system on market areas,
6. Upgrade existing power supply and install improved lighting in the market and adjacent open areas, and

III. Recommendation

1. Elevate the concrete foundation of the pier to at least 2 meters high to give allowance to probable sea level rise resulting from global climate change overtime.
2. Use huge and massive piles to be embedded firmly and strongly in the ground, together with quality fill in materials in establishing a climate resilient concrete foundation of the pier.
3. Monitor regularly the quality of underground water to ensure that no trace of coliform or any kind of miro-organism has permeated and contaminated the water table.
4. Tree planting on empty spaces for wind breaker and heat regulator. Broad leaves species trees with deep rooting system could best serve as tree cover both for aesthetics and protective buffer strip against the piercing heat, especially during summer. They also contribute to reducing Green House Gas (GHG) as trees are regarded as good carbon sink,
5. Mangrove reforestation. There should be a massive mangrove reforestation along the shallow brackish water area within the mouth and along the east bank of the Teuk Chuu river. This is to provide a good spawning ground for fish and other marine resources, as well as protection from probable storm surge, resulting from global climate change in the future,
6. Integrated solid waste management. Aside from the provision of trash cans and garbage bins to contain solid waste matters from the crab market or at the future pier area, proper and systematic waste collection, segregation and recycling should be the practice of everyone in the community. To instil it as a value for all, there should be continuous information campaign and public education, to include the inclusion of the subject matter

to the curriculum of school children. Likewise, tourists and visitors should strictly observe proper solid waste disposal in public areas. Penalty should be imposed to violators,

7. To make proper waste management a sustainable practice for all, there should be an incentive build into the practice, aside from having a healthy and safe environment. The private sectors should be encouraged to invest in waste recycling processing units, so that the public, particularly the rural poor can be involved in collecting, selling and recycling solid waste materials for income. In return, the private investors should be given tax exemption or rebates as an incentive.
8. Elevate and renovate Crab Market restaurants at least 2 meters higher in elevation than the ABR facility. The Kep City government in partnership with the restaurant owners should co-invest in building a more permanent and stable multi-purpose 3-floor level infrastructure that can serve as eatery (1st floor), public/private office (2nd floor) and hotel (3rd floor). Although, this is not included in the current ADB Loan project on Tourism Infrastructure but more as a private-public investment, this should be part of the entire package of improving the environmental services at the Crab Market area,
9. Construct and improve the drainage system of both pier and crab market area. To minimize, if not avoid the constant occurrence of flush floods by run-off water coming from the higher areas during the peak of raining season, there should be more outlets with wider channels draining to sea,
10. Construct artificial wetlands to contain treated waste water. Since the current sub-project is investing much in treating waste water from both Kampot pier and Kep crab market, and only to drain it back into the ground, there should be a system to recycle the treated water for other value added use. Construction of artificial wetlands wherein, it could be vegetated with phytoremediating plants and flowering lilies and lotus for aesthetics can add tourist attraction in the area. Such constructed wetlands can also be used for water sporting or floating restaurants.
11. Recycle treated waste water for irrigation. Since there is limited surface water for irrigation in the area, treated waste water from both Kampot pier and Kep crab market could be used for irrigation purpose. This alternative use can also address the concern of possible infiltration of waste water into the ground source that can pose health problem to the local residence.

IV. Discussion and Comments

After presentation, discussion was opened for participants.

4.1. Comments and concerns from Kep Participants

The key discussion and comments are included in following:

- Wastewater after treatment should be reused to reduce discharge to sea water and save water to be used for tree or garden at the project sites.
- Where will sludge of the wastewater treatment dispose to? All participants agreed that the sludge should be disposed to a landfill where approve by local government or officer in charge.
- Participant from the Provincial Department of Public Works and Transport commented to consider on quality of sewage pipe, particularly product from Germany.
- The participants proposed project to build capacity to officers at provincial level (PIU), particularly mechanism on management.

- Project should organize public awareness and training to venders to participate in solid waste management in the market and community surrounding the market.
- All participants also agreed on the proposed recommendations in the presentation.

4.2. Comments and Concerns from Kampot participants

- Provincial Department of Environment (PDoE) officer raised that the treatment site may need a large land to treat the wastewater. This wastewater may effect on salt farms which locate near the project site. Therefore, project must design carefully to meet technical aspects on how to avoid any impact on the farms. In addition, a treated wastewater should be re-used for garden at the project or other kind of irrigation to reuse it as much possible.
- PDoE's officer also commended to recycle solid waste to reduce waste amount to dispose at dump site.
- Sludge after wastewater treatment can be treated at Kampot's sludge treatment facility supported by GREET, NGO, before disposing. It noted that the NGO, GREET, now is constructing a small facility/factory to treat sludge from households and factories in province thus our project here can operate with the GREET. We, Ministry of Environment as well as PDoE, will not allow any one/project to dispose hazardous waste including sludge illegally.
- As for Provincial Director of Tourism Department comments that the project should grow additional tree along the proposed rehabilitation road including road along the beach from the provincial town thus they will make more attractive to absorb tourist into the province. He added that we really support on the recommendation on tree planting. I therefore propose to grow mangrove along the beach, particularly in front of the Pier Project Development.
- Participants also recommended designing a treatment plant with proper cover to avoid impact on public health and tourism.
- Participants also agreed on the proposed recommendation in the findings.

Appendix C: List of meeting participants

ព្រះរាជាណាចក្រកម្ពុជា

ជាតិ សាសនា ព្រះមហាក្សត្រ

មន្ទីរទេសចរណ៍ខេត្តកែប
អង្គភាពអនុវត្តគម្រោង

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ស្តីពី

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០១	Sour Setty	M	Environment	MOT	012555021		
០២	Ramu [illegible]	M	Envt Safeguard Specialist		962439518		
០៣	[illegible]	ស្រី	PIU	[illegible]	017821044		
០៤	[illegible]	[illegible]	[illegible]	[illegible]	070394757		
០៥	[illegible]	ប្រុស	[illegible]	[illegible]	017777920		
០៦	[illegible]	ស្រី	[illegible]	[illegible]	088378 1111		
០៧	[illegible]	ស្រី	[illegible]	[illegible]			
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ស្រី......03........នាក់

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អង្គភាពអនុវត្តគម្រោង

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បញ្ជីវត្តមាន

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ល.រ No.	នាម-គោត្តនាម Name	ភេទ Sex	មុខងារ/អង្គភាព Position	លេខទូរស័ព្ទ Phone Number	ហត្ថលេខា signature
១	Say Sranol	M	Director PIU Kampot	012820782	
២	So. Phanny	M	DOT. Kp	012715869	
៣	Sour Sethy	M	Environment Sp.	012555.021	
៤	Pov Vantha	M	DPWT	016 212498	
៥	Suy Chanras	M	DoE	015777554	
៦	Nop Chhunheng	M	PIU Accountant	077 781113	
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ប៊ុនធឿន-ច័ន្ទវល័ក្ខ

ភូមិ ១ ឧសភា, សង្កាត់ កំពង់កណ្តាល, ក្រុងកំពត, ខេត្តកំពត

លេខទូរស័ព្ទទំនាក់ទំនង ៖ (855)12 820 782, (855)12 343 725

ព្រះរាជាណាចក្រកម្ពុជា

ជាតិ សាសនា ព្រះមហាក្សត្រ

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អង្គភាពអនុវត្តគម្រោង

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បញ្ជីវត្តមាន

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ល.រ No.	នាម-គោត្តនាម Name	ភេទ Sex	មុខងារ/អង្គភាព Position	លេខទូរស័ព្ទ Phone Number	ហត្ថលេខា signature
១	Say Sroul	M	Director PIU Kampot	012820782	
២	So. Phanny	M	DOT.Kp	012715869	
៣	Sour Sethy	M	Environment Sp	012 555.021	
៤	Pov Vantha	M	DPWT	016 212498	
៥	Suy Channas	M	DoE	015777554	
៦	Nop Chhunheng	M	PIU Accountant	077 781113	
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មន្ទីរទេសចរណ៍ខេត្តកែប
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១	[illegible]	ប្រុស	[illegible]	[illegible]	012-867874		
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៨	[illegible]	ឯ	[illegible]	[illegible]	098 638018		
៩	[illegible]	ប	Project	Environmental	012 555 021		
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១១	[illegible]	ស	—11—	[illegible]	077 445155		
១២	[illegible]	ស	—	[illegible] ADB	088 55 18977		
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អង្គភាពអនុវត្តគម្រោង

Asian Development Bank

GSM TIIG No. Loan 3194-CAM (SF)

បញ្ជីវត្តមាន

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កិច្ចប្រជុំពិភាក្សាបញ្ហាបរិស្ថានផ្សារក្តាម

ថ្ងៃទី២៥ ខែសីហា ឆ្នាំ២០១៦

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០១	Sour Sethy	M	Env. Inspector	MOT	012555021		
០២	[illegible]	M	Env. & Safeguard Specialist		012439518		
០៣	[illegible]	M	PIU	[illegible]	017821046		
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ប្រុស...05.....នាក់

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