Initial Environmental Examination

January 2018
Project 49387-002

Kingdom of Cambodia: Second Greater Mekong Subregion Tourism Infrastructure for Inclusive Growth Project

Kep and Preah Sihanouk, Cambodia

Prepared by Ministry of Tourism with the provinces of Kep and Preah Sihanouk for the Asian Development Bank. This is an updated version of the draft originally posted in March 2018 available on https://www.adb.org/projects/documents/cam-49387-002-iee.

CURRENCY EQUIVALENTS
(18 September 2017)

Currency unit	–	Riel R
R1.00	=	$0.00024
$1.00	=	R4,167

ABBREVIATIONS

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
MOE	–	Ministry of Environment
PAM	–	Project Administration Manual
PMCES	–	Project Management and Civil Engineering Support Consultant
PIU	–	Project Implementation Unit
PPTA	–	Project Preparatory Technical Assistance
PMU	–	Project Implementation Unit
REA	–	Rapid Environmental Assessment
RP	–	Resettlement Plan
RGC	–	Royal Government of Cambodia
GRM	–	Grievance Redress Mechanism
SPS	–	Safeguard Policy Statement (2009)

WEIGHTS AND MEASURES

km	–	kilometer
kg	–	kilogram
ha	–	hectare

In this report, “$” refers to US dollars.

EXECUTIVE SUMMARY

The second Greater Mekong Subregion (GMS) Tourism Infrastructure for Inclusive Growth Project will continue to develop small scale infrastructure to improve tourist facilities and develop and strengthen management capacity to enhance tourism at selected locations in Cambodia, the Lao PDR, and Viet Nam. In Cambodia three subprojects will be implemented in Kep and Preah Sihanouk provinces, which are addressed by the IEE presented herein.

The 3 subprojects in the two provinces are listed below.

Kep
• Kep Solid Waste Management Improvements
Preah Sihanouk
• Preah Sihanouk Seaside Access and Environmental Improvements • Preah Sihanouk City - Koh Rong Passenger Pier Improvements

Subproject Benefits

Kep Solid Waste Management Improvements

The existing arrangements for solid waste management in Kep are inadequate, characterized by low coverage, lack of sanitation awareness, and an open, unmanaged dumpsite. The subproject will address these problems by expanding the quality and coverage of solid waste collection and treatment services, develop a managed landfill site (9ha) on public land at the existing dumpsite, and support sanitation and waste management awareness programs. The upgraded solid waste management system will increase, and make more efficient solid waste removal from the streets and beach areas in Kep town.

The upgraded solid waste management system will assist implementation of the sub-decree on Solid Waste Management (2013). The sub-decree provides technical standards for all activities related to disposal, storage, collection, transportation, recycling, dumping of municipal and hazardous waste. The location of the landfill has also been reviewed in respect of Ministry of Environment (2016) Guidelines for Landfill Site Selection. The subproject will benefit the Kep's urban core (Sangkat, Sangkat Kep and around half of Sangkhat Prey Thom) with a residential population of 9,000, 95 hotels, and 52 restaurants/cafes, and various other commercial outlets. It will also support Kep city's environmental goals, which were recognized in 2016 through an ASEAN Environmentally Sustainable Cities Award and in 2017 an ASEAN Clean Tourism Award. Options for waste collection tariffs and/or an environmental tax are being considered to support operational and maintenance costs of the landfill.

The materials recovery facility (MRF) to be constructed at the upgraded landfill in Kep will organize, make safer and more efficient the current limited practice of solid waste recycling that is occurring at the existing dumpsite. The MRF will improve and make more sanitary the working conditions of garbage pickers while improving the efficiency and opportunities for he reduction, recycling and reuse of solid waste. The MRF will increase recyclables recovery using sanitary facilities and practices. The upgraded landfill and MRF will reduce pollution at the landfill site and

along the access road to the landfill. The managed network of modern waste cells overlying an impermeable liner, leachate collection and recycling, and gas capture and flaring at the landfill will protect groundwater, improve air quality, and reduce blowing solid waste at the site thereby improving the natural environment and working conditions of the waste pickers. The provision of new waste compactor trucks will prevent spillage of garbage along the access road to the landfill, and odor that was reported by residents along the road during the public consultations.

The septage treatment facility (STF) at the upgraded landfill will contribute to overall environmental improvement in Kep town, and especially the crab market, by providing a location for septic tank sludge to be deposited and treated safely.

Preah Sihanouk Seaside Access and Environmental Improvements

Preah Sihanouk received 2.1 million visitors in 2016 and forecasts suggest visitor arrivals could rise to almost 4 million in 2026. Weak planning and ad hoc development of Ocheuteal and Otres beaches has led to poor pedestrian access, traffic congestion, unsanitary drainage with intermittent flooding, and lack of public amenities. This situation creates public health hazards for residents and tourists, deters private investment, and puts future tourism growth at risk.

In addition to about 7 km of roads, drainage, and sidewalk improvements, and improvements to pedestrian and vehicular access to the beaches, the subproject will improve the tourist experience and comfort by providing 12, 35m^2 public toilet blocks with showers. Implementation of the subproject will be coordinated with the ADB-financed Second Corridor Towns Development Project and Provincial Water Supply and Sanitation Sector Project to ensure that all road improvements are properly sequenced with planned installation of sewage trunk lines, pumping stations, and residential connections. The subproject will benefit 41 hotels with 2,167 bedrooms, and 240 restaurants, and 12,878 residents

Preah Sihanouk City City–Koh Rong Passenger Piers Improvements

The proposed new pier at Victory beach (Preah Sihanouk City mainland) at Koh Touch beach (Koh Rong island) will address current problems of overcrowding at existing structurally unsound piers in Preah Sihanouk City and Koh Rong. The provision of toilets at both piers and parking at Victory beach pier will also improve environmental management and the tourist experience. The new piers will reduce the chronic congestion, and hazardous conditions for passengers and boat operators that negatively affect shorefront environment. The planned 850m-long 2m-wide concrete walkway linking the commercial area at Koh Touch beach with the island pier will improve drainage and pedestrian safety along the beach. Koh Rong Island is within a national Marine Protected Area, the subproject site is within the Multiple Use Zone where construction activities are allowed. The subproject will benefit 38 ferry boat operators, 31 associated business operators, and an expected 438,000 passengers during the first year of operation.

Potential Impacts

The three subprojects are classified Category B for environment pursuant to ADB's safeguards Policy Statement (SPS) 2009.

Pre-construction Phase

The pre-construction phase includes the detailed design (DED) of the subprojects when, *inter alia,* the subproject locations, engineering, and institutional arrangements are finalized. For the

detailed design of Kep landfill, information on the history and regulatory status of the existing dumpsite, and immediate affected environment is required. The depth and quality of the groundwater at the existing dumpsite needs to be determined. The depth of the water table, local hydrological regimen and soil permeability need to be clarified for the design of the upgraded landfill to ensure that risks of groundwater contamination and storm water run-off impacts are understood and prevented. A draft ToR for a groundwater study at the landfill north of Kep is appended to the IEE. The separate groundwater and soils study forms part of the Environmental Compliance Audit (ECA) of the dumpsite that must be conducted. An ECA must be prepared because the dumpsite is an "*existing facility"* as defined by the SPS (2009). The terms of reference for the ECA are appended to the IEE (Appendix C). The final IEE, to be prepared based on the landfill's detailed, and the updated EMP will serve as the corrective action plan for the ECA.

Major activities which follow the pre-construction phase which are detailed in the subproject EMPs are updating and initiation of the land acquisition and resettlement plans (LAR) and EMPs to meet the final subproject designs, and preparation construction package tender documents and procurement of contractors.

Potential impacts associated with the pre-construction phase of the three subprojects – ahead of the initiation of land clearing and civil works concern land acquisition and resettlement. The only subproject with expected minor land acquisition impacts (23 households, none severely affected) is Preah Sihanouk Seaside Access and Environmental Improvements in Preah Sihanouk province. Any required land acquisition/resettlement are addressed in the inventory of losses (IoL) and LAR reports prepared separately for the subprojects. The LAR includes a grievance redress mechanism and budget covering the direct compensation costs, implementation costs, and contingencies.

An important activity that must occur ahead of all civil works and excavation activity is the three subproject areas must be visited and reviewed by the military to ensure they are free of unexploded ordinance (UXO). The executing and implementing agencies will coordinate required UXO identification and clearing with the military.

Construction Phase

The potential environmental impacts in Kep and Preah Sihanouk are primarily construction phase-disturbances of the individual subproject component areas. Common impacts of the civil works will be, for example, reduced and/or blocked public access to areas, noise and dust 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 congestion and traffic accidents, land erosion and shoreline sedimentation at the sites of the two piers, localized drainage and flooding problems, solid waste and domestic pollution from worker camps, and communicable disease and social problems caused by migrant workers.

The short-term construction impacts and disturbances will occur at different levels of magnitude depending on the civil works activity and the subproject site. Impact mitigation measures are prescribed which follow standard accepted construction practices as well as IFC/World Bank EHS sector guidelines for different construction.

The construction impacts and disturbances, and required mitigation measures for the Preah Sihanouk Seaside Access and Environmental Improvements are mainly to manage and minimize disturbance and disrupted access of the beaches by tourists, and disruption of existing small

business activity along the beachfronts. Construction scheduling and isolation of civil works activities from tourist activities is important.

Preah Sihanouk City–Koh Rong Passenger Pier improvements mitigation measures will focus on minimizing aquatic habitat and water quality impacts, and possible disrupted boat traffic near the two sites. Use of berms and silt curtains around pier construction sites should be implemented to contain erosion and resuspended sediment. The potential disturbance during construction phase will be greatest at Koh Touch beach because of the relatively high density of tourists and residents at that site.

Operation Phase

The potential impacts of the operation of the completed subprojects arise from increased vehicle traffic along the upgraded landfill access road, the increased vehicle traffic induced by access improvements to Otres and Ocheuteal beaches, and the increased traffic to the new pier on Victory beach. Enforced speed limits must be clearly posted along the roadways. The sustainability of the operation of upgraded landfill according to design specifications and resultant reduction in solid waste pollution in Kep is dependent on sufficient annual O&M support for solid waste management. As an example, there is a small risk that the liner of the landfill, stormwater drainage system, or septage treatment could fail or require repair during operation. Such a problem event would require sufficient O&M to correct.

The new piers and targeted increases in tourist activity could create boat traffic environmental issues at, and in the areas of Koh Touch and Victory beaches defined by increased boat traffic congestion & risk of collisions, pollution from solid waste, gas, oil, and discharged wastewater holding tanks, and interference with other local activities such as fishing. Further, the Koh Rong Marine Protected Area (MPA) in which the new pier on Koh Touch beach is located could be negatively affected by the above potential impacts. Boat traffic must follow existing marine navigation regulations. Increased solid waste production at the Sihanouk subproject sites will become a problem if sufficient O&M is not provided to the DOT to regularly collect and dispose solid waste at DOE-approved sites in Preah Sihanouk City which includes removal of waste from Koh Rong island by boat. Specific project assurances have been prepared that prescribe how the new piers, increased boat activity caused by the piers, and associated potential pollution will be managed (Appendix E). The assurances are directed toward protection of the MPA, and tourist safety, and include specification of sea lanes and boat speed limits to/from Koh Rong island, management of boat waste holding tanks, requirements of life jacket, and storm avoidance thresholds for tourist boat travel.

Climate Change

A Climate Risk and Vulnerability Assessment (CRVA) guided civil works preliminary designs and IEE preparation. The CRVA adopted climate change projections for rainfall and temperature prepared in 2015 for the subproject areas and modified subproject component designs such as road surface type, drainage capacity, and pier construction from national construction norms as the means to increase subproject climate resilience.[1] The estimated marginal increase in cost to make the road and pier subproject components resilient to climate change is approximately $2.7 million. The project will generate greenhouse gas (GHG) from anticipated increased vehicle traffic on subproject access roads, however, the increase in vehicles is not expected to exceed the

[1] Thoeun Hang Sen, 2015. Observed and Projected Changes in Rainfall and Temperature in Cambodia. Water and Climate Extremes.

100,000CO_2e/a [2]. Estimates of GHG emissions from potential increased boat traffic in the area because of the new piers will be computed when projected increases in the number and type of tourist boats is completed. However, like road vehicles, the increase in GHG emissions from tourist boats is expected to be insignificant.

Methane emissions (CH_4) from the upgraded Kep landfill should decrease to zero or be minimal because gas capture and control technology will be installed. The project also supports adoption of ASEAN Tourism Standards (e.g., Clean Tourist City Standard, Green Hotel Standard, and Clean Public Toilet Standard), which will result in carbon footprint reductions through increased energy efficiency (e.g., use of LED lighting) and reductions in GHG emissions.

The subproject's initial indicative sensitivity to climate change is classified "Medium" to "High" by the AWARE™ software tool due primarily to potential sensitivity to sea level rise and rainfall. The software does not generate an explicit sensitivity to changes to storm surge which is important, and which must be interpreted. The AWARE software combines geographic information on current site-specific climate, climate hazards from topography, elevation, and distance to ocean, and the latest climate change projections for each area. The subprojects are designed to be resilient to present-day climate extremes. Future changes in climate are defined primarily by rainfall intensity and flooding, and sea level and storm surge as summarized below:

- The heights of new piers will accommodate anticipated future sea level increase and be able to withstand more frequent and stronger storms. Concrete foundations will be fortified accordingly. The beachfront walkways and the new and upgraded support facilities such as tourist information buildings and parking lots are at elevations that are easily accessible and visually attractive to tourists, but which are also resilient to projected sea level rise and increased storm surge caused by climate change.
- Design criteria for upgraded access roads include road surfaces that do not absorb water and are not vulnerable to flooding and surface runoff. Road surfaces will be resistant to elevated air temperatures, with sufficient cross and lateral road drainage to prevent lateral ponding and flooding, and road bed aggregates used will shed water and be resistant to erosion.

Conclusions

The EMPs developed for each province provide impact mitigation plans, environmental monitoring plans, and specify the institutional responsibilities and capacity needs for the environmental management of each subproject. The EMPs will need to be reviewed and updated at the detailed design phase to ensure that they fully address the potential impacts of the final subproject designs.

The IEE concludes that the description of the subproject feasibility designs for Kep and Preah Sihanouk provinces combined with available information on the affected environments is sufficient to identify the scope of the project's potential environmental impacts. Provided that significant changes do not occur to the design of any subproject components, and that new sensitive environmental or social receptor data are not discovered, the subprojects will remain Category B for environment and will not require further detailed environmental impact assessment.

[2] ADB (2016) Guidelines for GHG Emissions Transport Projects

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I. INTRODUCTION

A. Background

1. The second Greater Mekong Subregion (GMS) Tourism Infrastructure for Inclusive Growth Project will develop small scale infrastructure to improve tourist facilities and develop and strengthen management capacity to enhance tourism at selected locations in Cambodia. Three subprojects will be implemented in Kep and Preah Sihanouk provinces, which are addressed by the IEE presented herein.

2. The projects will improve urban-rural transport infrastructure, urban environmental services, strengthen capacity to implement regional tourism standards, and strengthen tourism destination management. It will help transform secondary towns in the GMS Economic Corridors into green, inclusive and competitive international tourism nodes to boost trade in services and deepen market linkages between members of the GMS and Association of Southeast Asian Nations (ASEAN). The subprojects will build on the ongoing ADB-financed GMS Tourism Infrastructure for Inclusive Growth Project (2014–2019) in Cambodia.

3. The expected impact is sustainable, inclusive, and more balanced tourism development, as envisaged in the *ASEAN Tourism Strategic Plan 2016–2025.* The expected outcome is to increase the tourism competitiveness of secondary towns in Cambodia. Outputs include: (i) urban-rural access infrastructure and urban environmental services improved, (ii) capacity to implement ASEAN tourism standards strengthened, and (iii) institutional arrangements for tourism destination management and infrastructure operations and maintenance (O&M) is strengthened.

4. The subprojects in Kep and Preah Sihanouk City are listed below.

Table 1. Cambodia subprojects

Kep
• Kep Solid Waste Management Improvements
Preah Sihanouk
• Preah Sihanouk Seaside Access and Environmental Improvements • Preah Sihanouk City - Koh Rong Passenger Pier Improvements

B. Assessment Context

5. The project is classified environment Category B pursuant to ADB's 2009 *Safeguard Policy Statement*[3] and recent ADB good practice sourcebook.[4] 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 effective implementation of an environmental management plan (EMP).[5]

[3] ADB. 2009. Safeguard Policy Statement. Manila.

[4] ADB. 2012. Environmental Safeguards, A Good Practice Sourcebook, Draft. Manila.

[5] Footnote 4, pg. 19.

6. The IEE was prepared during the feasibility design stage of the project using available data and information on sensitive environmental receptors that exist at the different subproject sites. Detailed designs of the subprojects will follow project approval. EMPs that have been prepared for the subprojects will be updated where necessary to meet final detailed design requirements.

1. Impact Footprints

7. The two coastal beachfront subprojects in Preah Sihanouk are in established mainland and island tourist sites. Similarly, the solid waste subproject in Kep is located at an existing dumpsite including operational access road. Thus, the potential environmental impacts of the subprojects are expected to be beneficial in mitigating the impacts of ongoing tourism, and solid waste management at the subproject sites.

C. Structure of report

8. The IEE follows the outline provided in Appendix 1 of the SPS (2009). The results of the IEE are presented by individual subproject by province to minimize redundancy of background information. The two environmental management plans (EMPs) for the subprojects are based on and support the results of the IEE.

II. POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

A. Environmental Impact Assessment

9. Environmental impact assessment in Cambodia is guided by the Royal Government of Cambodia (RGC) sub-decree No 72 ANRK.BK on environmental impact assessment (EIA). In compliance with the sub-decree, 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 pre-submitted for approval by a f the Ministry of Environment (MOE). The decree provides a list of project types that proponents use to screen projects for requiring either an EIA or Initial EIA (IEIA). Consultations with the MOE and provincial Departments of Environment (DOE) indicated the final subproject designs in Kep and Preah Sihanouk will require either a IEIA or EIA that will be submitted and approved by MOE. As dictated by, the MOE is required to complete their review of a submitted IEIA or EIA within 30 days to conclude the approval process.

10. The IEE presented herein meets the requirements of Sub-Decree No 72 ANRK.BK on EIA and the supporting Prakas Guideline Conducting IEIA/EIA Reports, BRK-BST, September 2, 2009. For implementation of IEIA/EIA the Prakas on Requirement of National EIA Firms to be Registered with MOE, No. 215 BRK-BST, 19 May 2014 has been taken account of in the costs during detailed engineering design.

B. Legal and Policy Framework for Environmental Protection

11. 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, and promulgated by Preah Reach Kram/NS/RKM-1296/36;
- Law on Natural Protected Areas enacted by National Assembly, 2008 promulgated by Preah Reach Kram/NS/RKM/0208/007;
- Law on Fisheries Management and Administration (1989);
- Law on Forest enacted by National Assembly, 2002 promulgated by Preah Reach Kram/NS/RKM/0802/016;
- Law on Land enacted by National Assembly, 2001 promulgated by Preah Reach Kram/NS/RKM/0801/14;
- Law on Water Resource Management produced by Ministry of Water Resources and Meteorology (MOWRAM); and
- Circular No 01 SRNn issued on February 3rd, 2012, Royal Government of Cambodia on Cambodia Coastal Zone Development

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

- Law on Protection of Natural Areas (2008); and
- Sub-decree on Water Pollution Control (2009):
    - Annex 2: Effluent standard for pollution sources discharging wastewater to public water areas or sewer;
    - Annex 4: Water quality standard in public water areas for biodiversity conservation; and
    - Annex 5: Water quality standard in public water areas for public health protection.

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

- Guidelines on Landfill Site Selection (MOE, 2016)
- RGC Decree Management of Urban Garbage and Solid Waste, No. 113, NKR-PR 2013
- 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 (Kep) Creation of Fisheries Communities (2005); and
- Guidelines on establishment of protected forests, natural resources conservations, wildlife protection areas, protected forest for biodiversity conservation (2002 and 2004).
- Management of Means of Water Transport 00067, RGC, MPWT Circular #003 (2011)

14. 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), Ramsar convention (1999) and Climate Change convention (1995) (MOE 2006). The closest Ramsar site to subproject areas is more than 100 km away in Koh Kapok, Koh Kong province to the west.

15. Government Occupational and Community Safety and Health (OHS) guidelines 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. The guidelines are included in EMPs.

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 (IFC, 2007) will apply.

C. Agencies Responsible for Environmental Management and Assessment

17. The national agencies 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 Mine and Energy (MME);
- Ministry of Industry and Handicraft (MIH)
- Ministry of Land Management; and Urban Planning (MLUP);
- Ministry of Tourism (MOT);
- Ministry of Public Works and Transport (MPWT) and a cross-ministerial policy body of
- National Climate Change Committee (NCCC).

18. 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:

- Prepare and establish fishery resource and aquaculture inventories;
- Enact laws, regulations, and orders for fishery protection, management and improvement of fishery resources and habitat;
- Manage fishery zones, fishery conservation and establish fishery resource development policies;
- Conduct scientific studies of fisheries and aquaculture; and
- Inspect and manage fishery resource exploitation and aquaculture activities.

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

1. Review, evaluate, and approve submitted environmental impact assessments in collaboration with other concerned ministries; and
2. Monitor 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.

20. 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.

21. The IEE prepared for subprojects in Cambodia meets most of the EIA requirements of the MOE. Further, the subprojects in Kep and Preah Sihanouk are endorsed by the National Committee on Coastal Area Management and Development.[6] The IEE will provide guidance to the MOT and consultants who will prepare the IEIA or EIA for the MOE.

D. ADB Safeguard Policy

22. The ADB safeguard policy statement (ADB 2009) along with the *Good Practice Safeguard Sourcebook* (2012) clarify the rationale, scope and content of an environmental assessment and identify required supporting technical guidelines (e.g., World Bank/IFC EHS Guidelines 2007). Projects are initially screened to determine the level of assessment that is required according to the environmental classification, Category A, B, or C.

23. 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 SUBPROJECTS

24. The descriptions of the subprojects in Kep and Preah Sihanouk are provided below. These were prepared by an engineer and tourism specialist to estimate benefits of the individual subprojects. For assessment of potential impacts, subproject components that affect similar environments have been combined to avoid redundancy in the assessment.

A. Kep Province

1. Kep Solid Waste Management Improvements

25. The subproject components (Figures 1 and 2) are described below and summarized in Table 2. The current arrangements for solid waste collection and management are not sufficient for urban growth and the increasing number of domestic and international tourists. The existing dumpsite to be upgraded is in an undeveloped rural area approximately 13 km north-west of Kep town. An unpaved road links the site to National Road 33 near Domnak Chomg Oeurn market.

26. The existing arrangements for solid waste management are characterized by low coverage, lack of sanitation awareness, and an open, unmanaged dumpsite. The subproject will address these problems by expanding the quality and coverage of solid waste collection and treatment services, develop a managed landfill site (9ha) on public land, and support sanitation and waste management awareness programs (Table 2).

[6] NS/RKT/0212/079 Preah Reach Kret *on* Establishment of National Committee on Coastal Area Management and Development.

Figure 1. Location of Kep Dumpsite

Figure 2. Existing Kep dumpsite to be upgraded

Table 2. Components of Kep solid waste management improvements

Kep Solid Waste Management Improvements	Landfill • Preparatory earthworks & installation of a perimeter runoff interceptor drainage system; • Construction of an impermeable liner, leachate collection/treatment system, and a landfill gas recovery system (e.g., CH_4); • Construction of a small materials recovery facility for waste separation and recycling; • Construction of a medical waste treatment area; • Construction of a septage treatment facility (0.5ha), twin lagoon system; • Site office, toilets, and perimeter fencing; and • Landfill access road (3 km) will be paved with concrete (6m carriageway and verges). Support technology & capacity development • 3 new 10m^3 collection trucks & bulldozer; • two new vacuum trucks for septage collection; and • capacity building programs for operators as defined in PAM for Output 3 of the PPTA

27. The subproject will benefit the Kep urban core (Sangkat, Sangkat Kep and around half of Sangkhat Prey Thom) with a residential population of 9,000, 95 hotels, and 52 restaurants/cafes, and various other commercial outlets.

28. The upgraded landfill site will have a small materials recovery facility (MRF) for recyclable solid waste, and a septage treatment facility (STF) for septic tank sludge from Kep town, including the septic system at Kep crab market. Currently septage is dumped untreated at the dumpsite. The STF will be a simple twin lagoon system to minimize O&M requirements.

29. The MRF will be constructed on the property of the controlled landfill to receive and sort solid wastes that can be recycled. The MRF will intercept solid waste that is transported to the landfill. It is envisaged that the MRF will consist of a modern receiving building with sorting bins, scales, a payloader vehicle, administration office, and washroom facilities.

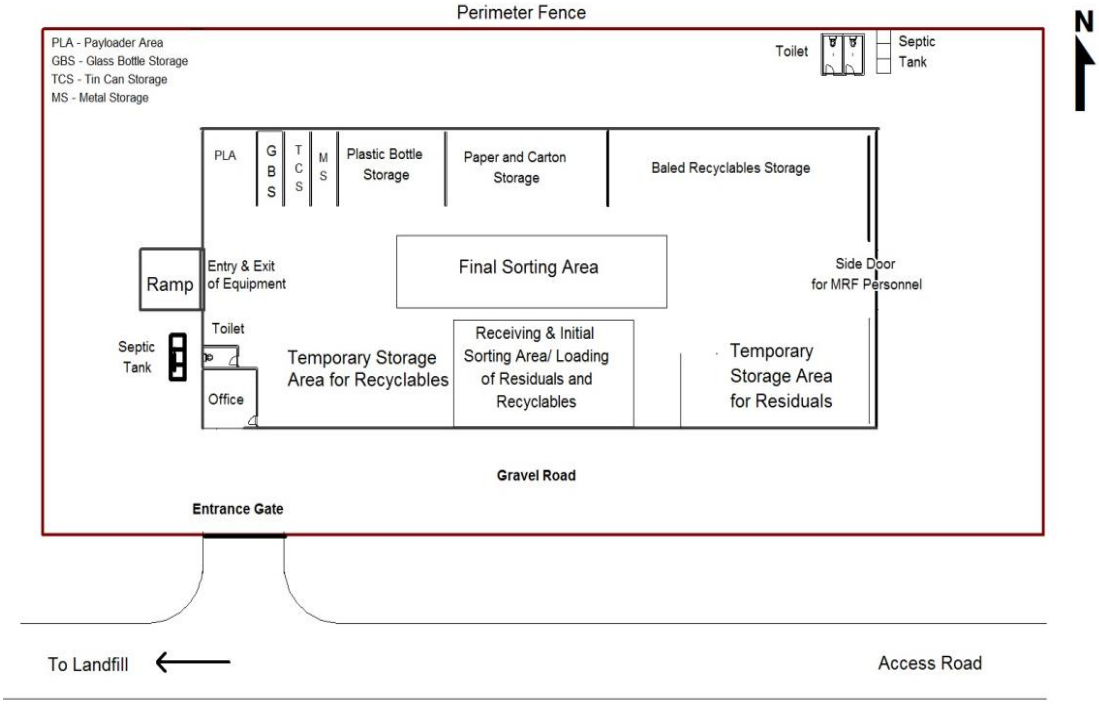
30. The MRF will employ trained waste pickers to sort materials. There are existing traders that purchase recyclable materials at market rates. Re-training and placement of existing waste pickers for the MRF is considered in the project's capacity development plan. Table 3 outlines some generic features for the MRF and
shows an example plan of a generic MRF facility. The scope and specific design of the MRF for the Kep landfill needs to be reviewed and completed at detailed design stage. Important design considerations for further assessment are fire-fighting equipment and the type of payloader vehicle to be used to move recycled material around site. The current waste stream received at the dumpsite will also be clarified at detailed design. As part of MRF development, formal training of waste pickers on waste types and segregation will occur.

Table 3. Generic Features of a Material Recovery Facility

Technology	Manual sorting aided by payloader for movement of waste and recyclables and by a baler for compaction of the recovered materials

Capacity	Facility will be designed to receive the estimated daily increase in production of dry, source segregated non-biodegradable waste and truck sorted recyclable materials using a team of sorters over the landfill's expected operational period.
Target Inputs	The primary inputs are dry, source segregated non-biodegradable waste from households, hotels, and crab market truck sorted recyclable materials.
Target outputs	Recyclable materials which include plastic bottles, tin cans, metal containers, carton and white paper, and metal
Design Features	Example 500 m^2 enclosed building with paved flooring and designated areas for receiving and sorting waste, storage areas for recyclable materials and residual materials, office, area for equipment and toilet and wash areas for pickers and facility supervisor/staff. Facility equipped with a payloader, baler, weighing scales, bins and a small power generating set. A main front door and 2 side doors and enclosed by a perimeter chain link fence
General Process Flow	Waste will be inspected then unloaded into the receiving/sorting area. Recyclables will be segregated from the waste pile and stored in designated temporary storage areas. Biodegradable and residual materials will be moved by the payloader into the adjacent managed landfill cell. Recovered recyclable materials will be weighed, baled or packed and/or sold to large junkshops or recycling facilities. Expansion o development of local or regional markets for the future recycled waste products have not been defined, or articulated in Output 3 of the PAM, but will be examined at detailed design.
Management and Operational Arrangements	The facility and landfill will be managed by Kep municipality. A private contractor collects and transports the waste from Kep to the MRF. Private management of the MRF will be explored. A technical supervisor and one (1) staff shall oversee the day to day operations of the facility. A minimum of four (4) waste sorters shall undertake the segregation of the recyclable components. The pickers shall be compensated in accordance with the amount of valuable materials recovered. Aside from assisting the facility supervisor, he shall also operate the baler and payloader. Recovered recyclables sold to recycling centers in province or Cambodia

Figure 3. Sample floor plan of Material Recovery Facility



B. Preah Sihanouk Province

31. The two subprojects in Preah Sihanouk province are described below and summarized in Table 4.

1. Preah Sihanouk Seaside Access and Environmental Improvements

32. In 2016, Preah Sihanouk received 2.1 million visitors with forecasted arrivals reaching 3.544 million by 2026. Weak planning and ad hoc development of the key tourist areas of Ocheutal and Otres beaches has constrained pedestrian access and causes traffic congestion, unsanitary drainage with intermittent flooding, with lack of public amenities. This situation creates public health hazards for residents and tourists, deters private investment, and puts future tourism growth at risk.

33. The subproject (Figure 4) will address these problems by: (i) improving landscaping and installing street lighting along Ocheutal Beach Road (1.2 km north-western section); (ii) improving a 1.75 km section of Ocheutal Beach Road to concrete pavement; (iii) improving a 0.34 km section of Ocheutal Beach Road to concrete pavement; (iv) improving the 0.2 km, 3.5 meter wide footpath around a headland that connects Ocheutal and Otres beach to concrete pavement with lighting; and (v) improve the existing Otres beachfront road and crossroads (4.0 km) to concrete pavement. All roads will be upgraded to a minimum carriageway width of 8m with 3.5m footpaths/cycle track, roadside drainage, and street lighting. The improvements at both beaches will incorporate 12, 35m^2 public showers and toilet blocks. Traffic counts were prepared to inform the preliminary design and IEE.

Table 4. Components of subprojects in Preah Sihanouk

Preah Sihanouk Seaside Access and Environmental Improvements	• Improve traffic management, pedestrian walkways, and landscaping of Ferry Pier Road and 1.2km of northwestern section of Ocheutal Beach Road; • Improve a 1.75 km section of Ocheutal Beach Road • Improve a 0.34 km section of Ocheutal Beach Road • Improve the 0.2 km X 3.5-meter-wide footpath around a headland that connects Ocheutal and Otres beaches with lighting; and • Improve the existing Otres beachfront road and crossroads (4.0 km) to concrete pavement.
Preah Sihanouk City –Koh Rong Passenger Pier Improvements	• New 600 m^2 concrete pier at Victory beach with associated facilities: - ticketing & waiting areas; - food and beverage service facilities; - toilets; and - vehicle parking. • A new 750 m^2 pier on Koh Touch beach, Koh Rong island with facilities: - ticketing & waiting areas; - toilets sanitation; - tourist information; - and retail kiosks • A new 850m X 2m concrete walkway with drains along Koh Touch Beach

34. Subproject implementation will be coordinated with the ADB-financed Second GMS Corridor Towns Development Project and Provincial Water Supply and Sanitation Sector Project to ensure that all road improvements are properly sequenced with planned installation of sewage trunk lines, pumping stations, and residential connections. The subproject will benefit 41 hotels with 2,167 bedrooms, 240 restaurants and other commercial outlets, and 12,878 residents.

2. Preah Sihanouk City–Koh Rong Passenger Pier Improvements.

35. Preah Sihanouk City has several passenger piers in use for trips to the Koh Rong archipelago. The central pier at Ocheuteal beach is used by individual tourists and tour groups. While the pier has recently been upgraded, the pier location congests the area and contributes pollution to one of the most well-used public beaches. Further, the approach road to the pier is a dead-end and has severely limited space for traffic, especially for coaches and buses that must be able to turn around to exit the area. Contrastingly, the Victory Beach site has much more unused area for parking and through bus traffic.

36. Koh Touch beach, the main gateway to Koh Rong Island, has three operating piers; one government and two privately operated. Koh Rong received about 300,000 visitors in 2016 and this could increase to more than 500,000 in 2026.

37. Since the introduction of fast ferry services in 2012 the number of trips between Preah Sihanouk City and Koh Rong has increased to 7,400 per year (2016) and is expected to double by 2026. The existing ferry piers in Preah Sihanouk City and Koh Touch are poorly constructed and easily overwhelmed and unsafe for high volumes of passengers during peak periods, and lack sanitation and adequate parking. This causes congestion, hazardous conditions for passengers and boat operators, and negatively impacts the shorefront environment.

38. The subproject will address these problems by constructing a new 600m^2 concrete pier with associated facilities at Victory Beach on vacant government-owned land (4,000 m^2) that is reserved for this purpose (Figure 5). Victory Beach Pier will incorporate ticketing/waiting areas, food and beverage service facilities, toilets, and vehicle parking. A new 750m^2 concrete pier at

Koh Touch Beach, Koh Rong, incorporating ticketing/waiting area facilities, sanitation, tourist information and retail kiosks will also be constructed (Figure 6). The subproject will benefit 38 ferry boat operators, 31 associated business operators, and an expected 438,000 passengers during the first year of operation and support projected future growth of tourism.

Figure 4. Segments of Ocheuteal and Otres beach access to be upgraded.

Figure 5. Layout of new pier & facilities on Victory beach in Preah Sihanouk City

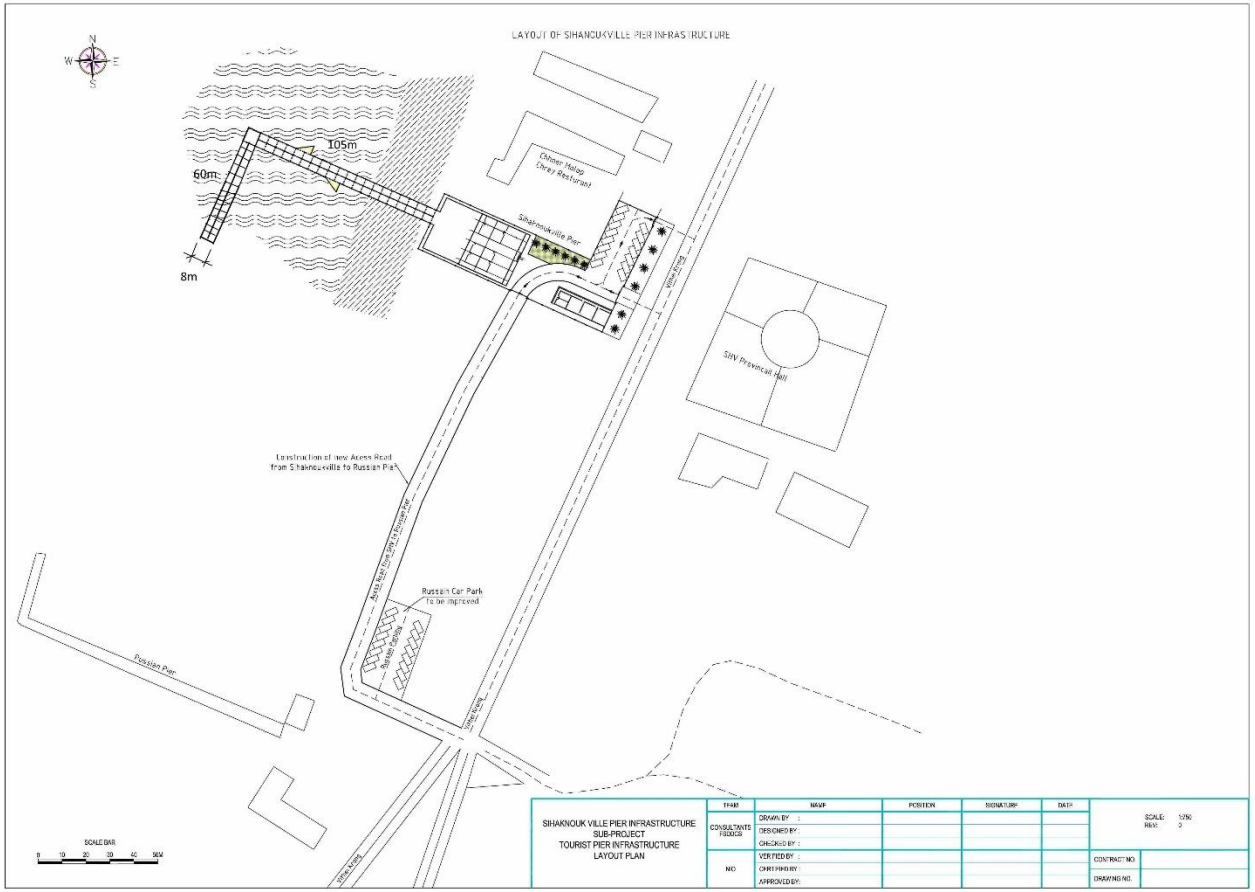


Figure 6. Location of new pier (black) on Koh Touch beach, Koh Rong island

IV. DESCRIPTION OF AFFECTED ENVIRONMENTS

A. Overview of Physical Southern-coastal Cambodia

1. Physical Resources

a. Climate

39. Southern Cambodia experiences a tropical monsoon climate with two distinct seasons defined by; (1) 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; and (ii) the wet season from May to October during which rainfall is largely derived from the southwest monsoon drawn inland from the Indian Ocean.

Table 5. Rainfall data from 2011-2015

Year	Month												Total
	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	No	De	
2011	1.2	12.8	12.6	119.8	97	277.6	355	442.8	732.5	131.9	44.7	5.4	2346.7
2012	47	126.6	97.4	108.1	394.9	273.3	397.4	271.8	714.9	169	145.8	12.2	2758.4
2013	6.6	27.4	69.8	187.6	237.2	312.7	608.4	319.5	459.5	294.3	114.2	44.8	2682.2
2014	00	0.4	23.4	49.6	121	491.6	591.9	412.3	513.1	252.9	165	104.4	2725.6
2015	2.8	16	27.4	50.8	190.4	459.2	321.1	458.2	636.4	146.2	184.5	25.7	2504.3
Average	11.5	33.8	68.8	103.2	208.1	362.9	454.7	381	611.3	198.9	130.8	38.5	2603.4

(Source: Ministry of Water Resources and Meteorology, 2015)

40. The average highest rainfall is in July 454.7 mm and the lowest rain fall is in Jan 11.5 mm (Table 5). The average annual rainfall in Preah Sihanouk City is 2,603.4 mm with the greatest recorded total annual rainfall of 2,758.4 mm in 2012.

Table 6: Humidity levels (%) from 2011-2015

Year	Month												Total
	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	No	De	
2011	76.5	80.8	87.1	81.0	80.6	82.5	84.1	85.5	86.3	83.5	81.4	76.3	82.1
2012	56.3	60.1	61.6	65.1	61.9	65.5	79.0	75.4	86.2	80.2	77.6	71.2	70.0
2013	68.3	70.9	59.7	70.8	71.0	78.3	82.0	82.0	81.8	80.7	72.9	64.3	73.6
2014	76.9	77.4	78.4	78.1	78.8	81.1	80.9	80.0	80.8	79.3	78.8	75.9	78.9
2015	80.1	82.3	81.6	80.2	79.5	81.8	81.5	83.6	85.0	85.7	82.0	77.0	81.7
Average	**71.6**	**74.3**	**73.7**	**75.0**	**74.4**	**77.8**	**81.5**	**81.3**	**84.0**	**81.9**	**78.5**	**72.9**	**77.3**

(Source: Ministry of Water Resources and Meteorology, 2015)

41. The average highest humidity is in September 84 % and the lowest is in January (71.6 %) (Table 6). The average annual humidity in Preah Sihanouk City is 77.3 % with the greatest recorded total annual 82.1 % in 2011.

Table 7: Average temperature from 2010-2014

Year	Month												Total
	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	No	De	
2010	27.75	28.75	30.25	30.25	29.75	28.75	28	26.5	26.5	27.25	27.25	27.25	28.19
2011	26.75	29	25.75	28.45	28.25	27.25	27.75	26	27.25	28	27.75	25	27.27
2012	28.35	26.5	28.25	28.75	30.75	28.75	27.75	26.5	26.65	27.75	26.75	27.25	27.83
2013	27.7	28	29	29.75	29.25	28.5	25.5	27.75	27.5	28	28.1	25.5	27.88
2014	25.95	26.95	28.05	29.15	29.7	28.3	27.2	27.85	27.45	28.4	28.35	27.45	27.9
Average	27.30	27.84	28.26	29.27	29.54	28.31	27.24	26.92	27.07	27.88	27.64	26.49	27.81

(Source: Ministry of Water Resources and Meteorology, 2015)

42. Average highest temperature is in April (29.5^{0}C) and the lowest temperature is in December (26.5 ^{0}C) (Table 7). Average annual temperature in Preah Sihanouk City is 27.8 ^{0}C.

b. Soils

43. The soils of coastal Kep and Preah Sihanouk are dominated by a mix of old and young alluvium soils of sediment deposits from rivers and streams (Figure 7)[7]. These are mainly finer sediments. A high concentration of silt is found in the coastal and nearshore areas. Alluvial deposits normally result in fertile land.

2. Forest Areas

44. The forest types and areas of Cambodia are shown in Figure 8[8]. Most of the major forests are situated in the southeastern, central, and northeastern regions of the country. Forest cover in Kep and Preah Sihanouk is relatively sparse due to long past land clearing deforestation with the closest major forests being evergreen and located in Kep National Park north of Kep town, and Ream National Park east of Preah Sihanouk Figures 10 & 11). Other forested areas in the Preah Sihanouk province are located far north of Preah Sihanouk City.

[7] MOE 2004

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

Figure 7. Soil types of Cambodia

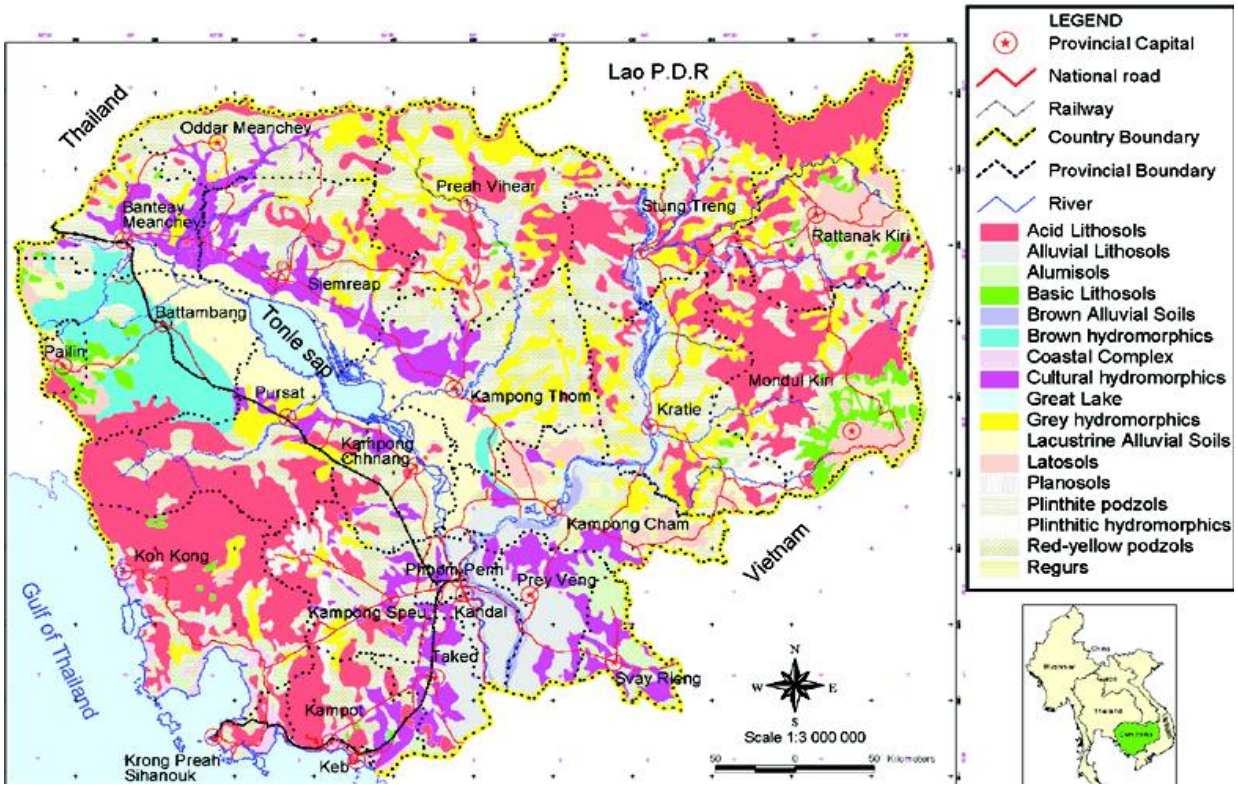
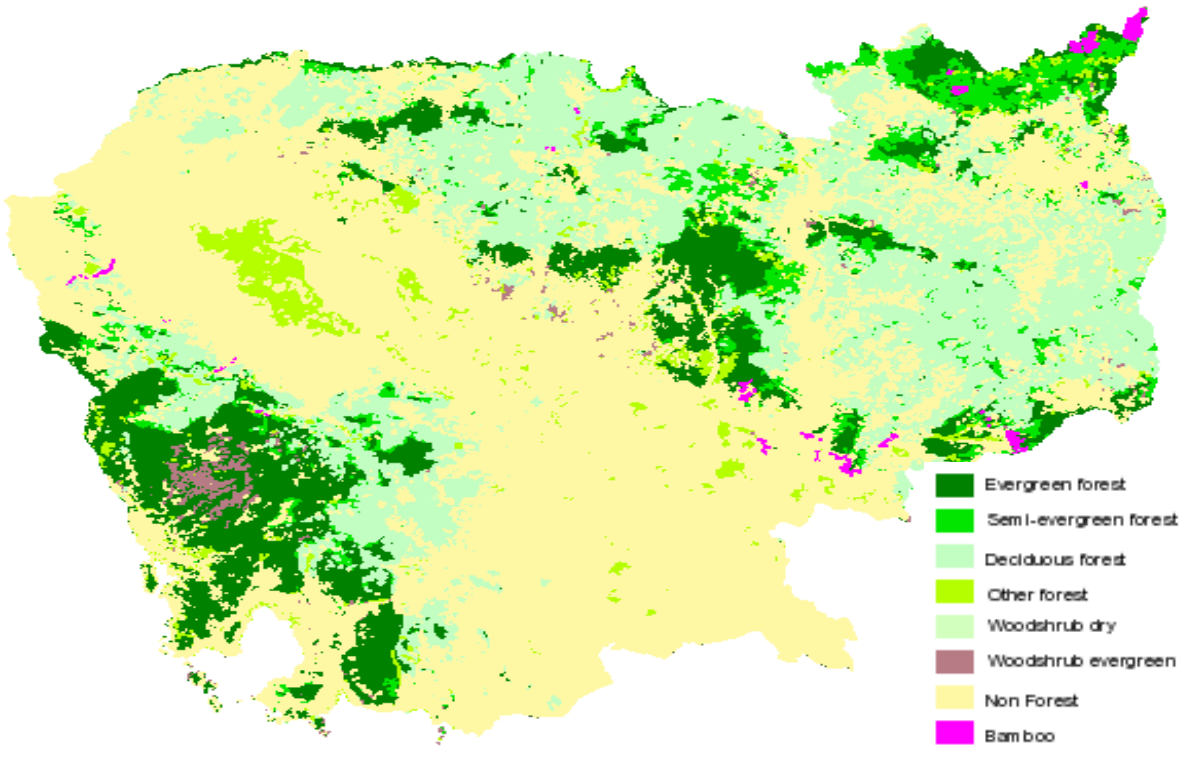


Figure 8: Forest type in Cambodia



B. Kep and Preah Sihanouk provinces

45. Preah Sihanouk province is bordered to the north by Koh Kong province and to the east with Kampot province. Kep province is coastal also but is situated inside Kampot province. Preah Sihanouk City is located on the coast approximately 230 km from Phnom Penh and 110 km west of Kep town. Preah Sihanouk City municipality expands 868 km^2 and consists of four districts (Khan) and 28 communes (Sangkat) and 111 villages. Sihanouk town consists of 5 Sangkats and 14 villages within 3,446 families, 8,084 being women (CDB, 2015). Whereas, Kep town is smaller and consists of 4 main Sangkats.

1. Topography

46. The topography of Preah Sihanouk and Kep provinces consists of a mix of lowland and upland areas. The lowland periphery of Preah Sihanouk consists of coastal beaches, scattered mangrove forests extending east to Kep province (surrounded by Kampot province), and scattered aquaculture. North of the beaches, Preah Sihanouk City and Kep towns rise abruptly to an elevated plain that has been designated a water recharge zone. Across the elevated plain area is scattered agriculture and patchy forest. The economic zone and port area extends west and northwest around and along the coast.

2. Surface Water Quality

47. The available surface and coastal water quality data of southern Cambodia is relatively 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 to pollution from untreated effluents, land erosion, and agriculture chemicals. Water quality Koh Tas and Koh Krabei islands (Figure 9) near Koh Rong island is summarized in Table 8. Water quality in Koh Pou, Kep is listed in Table 9.

Table 8. Water quality in Koh Krabei and Koh Tas Island 2014 – 2015

No	Parameters	Unit	Results		Government Standard
			Koh Krabei 2014	Koh Tas Island 2015	
1	pH		7.79	7.68	7-8.3
2	Temperature	^{0}C		21.60	< 45
3	TDS	mg/l	14.32	16.50	<1000
4	DO	mg/l	6.35	6.71	2.0-7.5
5	TSS	mg/l	258	346	25-100
6	Chloride (Cl)	mg/l	ND	129	<500
7	Nitrate	mg/l	40.83	0.37	< 10
8	Phosphate	mg/l	ND	ND	<3.0
9	Sulphate	mg/l	1991.13	4.06	< 300
10	Ammonium	mg/l		ND	<1.0
11	BOD5	mg/l	1.26	1.5	1-10
12	COD	mg/l	2.80	3.68	2-8
13	Total Nitrogen	mg/l	0.33	0.36	0.2-10
14	Total phosphorus	mg/l	0.05	0.02	0.02-0.09
15	Arsenic (As)	mg/l	0.007	0.0002	<0.01

16	Iron (Fe)	mg/l	0.11	0.13	
17	Lead	mg/l	0.006	ND	0.01
18	Mercury	mg/l	ND	0.0003	0.0005
19	Total Coliform	mg/l	7.5 x10^2	6.4 x 10^2	<1000
20	E-Coli	mg/l	0	56	

Figure 9. Islands of Preah Sihanouk including Koh Rong

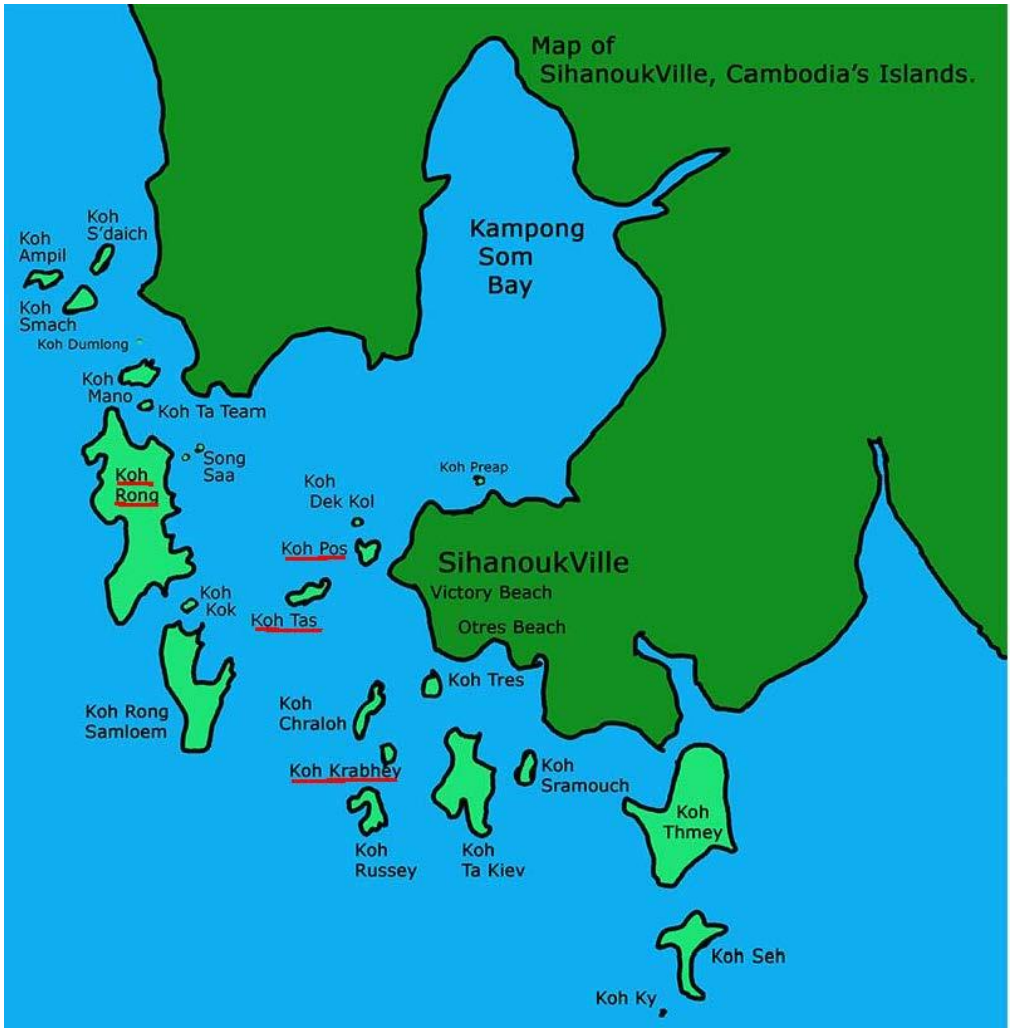


Table 9. Water quality in Koh Pou Kep.

No	Parameters	Unit	Results				Government Standard
			L1	L 2	L 3	L 4	
1	pH		7.56	7.72	7.64	7.75	7-8.3
2	Temperature	^{0}C	21.80	21.65	22.01	22.08	< 45
3	TDS	mg/l	11.59	11.63	11.95	11.49	<1000
4	DO	mg/l	6.35	6.49	6.65	5.88	2.0-7.5

No	Parameters	Unit	Results				Government Standard
			L1	L 2	L 3	L 4	
5	TSS	mg/l	220	230	250	220	25-100
6	Chloride (Cl)	mg/l	561	573	540	573	<500
7	Nitrate	mg/l	0.52	0.57	0.58	0.63	< 10
8	Phosphate	mg/l	ND	ND	ND	ND	<3.0
9	Sulphate	mg/l	0.39	0.49	0.58	0.82	< 300
10	Ammonium	mg/l	0.10	0.15	ND	ND	<1.0
11	BOD5	mg/l	0.86	0.91	0.89	0.93	1-10
12	COD	mg/l	2.19	2.86	2.98	3.19	2-8
13	Total Nitrogen	mg/l	0.60	0.60	0.53	0.59	0.2-10
14	Total phosphorus	mg/l	0.03	0.02	0.03	0.04	0.02-0.09
15	Arsenic (As)	mg/l	ND	0.001	ND	ND	<0.01
16	Iron (Fe)	mg/l	0.07	0.10	0.13	0.16	
17	Lead	mg/l	ND	ND	ND	ND	0.01
18	Mercury	mg/l	ND	ND	ND	ND	0.005
19	Total Coliform	mg/l	$6.4x10^2$	$4.3x10^2$	$9.3x10^2$	$1.5x10^2$	<1000
20	E-Coli	mg/l	36	30	74	110	
21	Detergent	mg/l	ND	ND	ND	ND	0.02
22	Oil and Grease	mg/l	0.48	0.78	1.39	1.60	

48. For completeness a summary of earlier sampled water quality during the dry season at river and coastal sites is in Table 10**.** Recent water quality survey sites for Preah Sihanouk City and Kep are shown in Table 10[9] and summarized in Table 10. Note that the landfill site north of Kep town is not near surface waters (lake, river, stream).

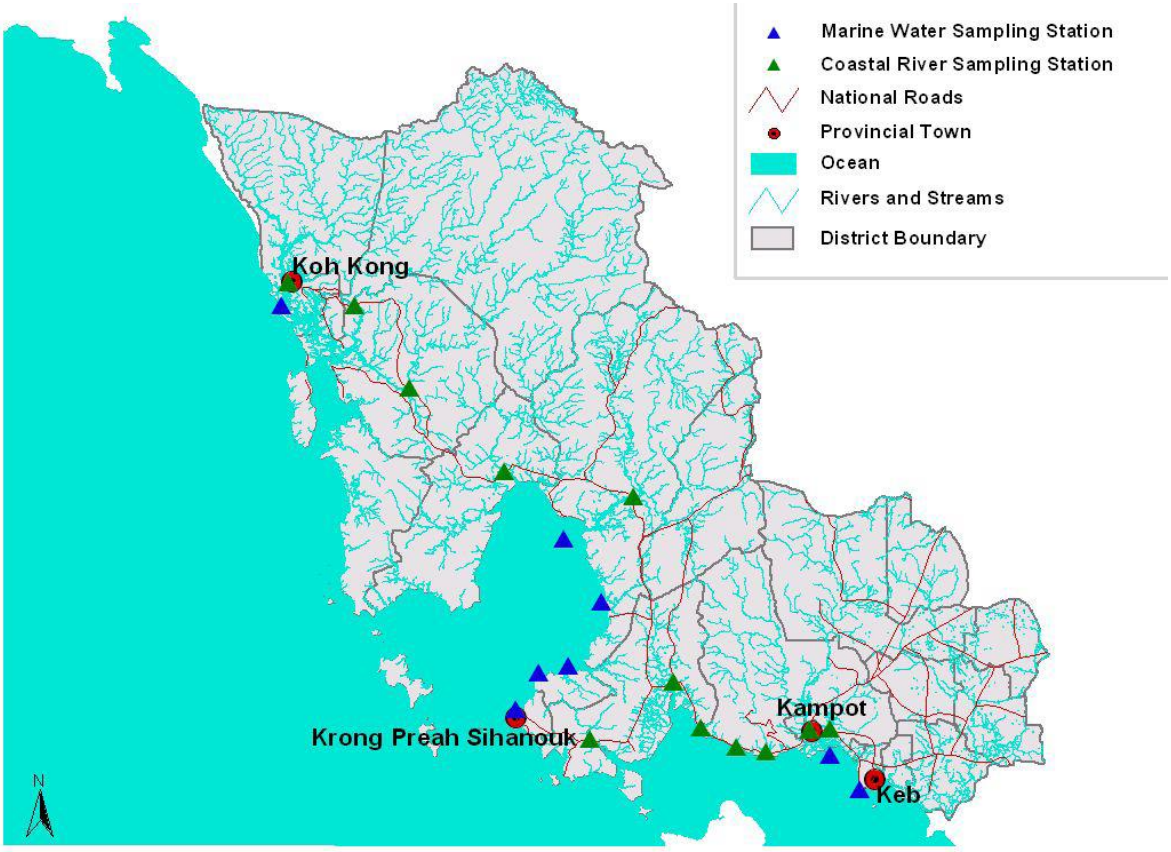
Table 10: Dry-season River and Coastal Water Quality 2005 - 2006

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	7 - 8.5
Salinity (%o)	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	0.2-10
total phosphorous (mg/l)	0.008	0.02	0.002	0.02-0.09
Coastal 96 samples from 8 sites				
Temp	29.6	32.5	26.1	
pH	7.8	8.1	7.6	7.0 – 8.5
Salinity (%o)	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	25-100

[9] DOE and Danida, 2006. Second Annual Monitoring report for Coastal Rivers and Nearshore Coastal Waters of Cambodia.

Variable	Average	Maximum	Minimum	Government Standard
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	1 - 10
total nitrogen (mg/l)	0.1	0.21	.05	0.2-10
total phosphorous (mg/l)	0.008	0.018	0.002	0.02 – 0.09

Figure 10. Water quality sampling sites in Kampot and near Kep



3. Air quality

49. Air quality for Koh Pous and Havai beach, and Koh Tas island near Preah Sihanouk City (Figure 9) and Koh Pou, Kep are provided in Tables 11, 12 and 13.

Table 11. Air quality in Koh Pous and Havai Beach

No	Parameters	Unit	Koh Pous bridge	Havai beach	Standard
1	Carbon monoxide	mg/m^3	1.25	0.416	20
2	Nitrogen Dioxide	mg/m^3	<0.004	<0.004	0.1
3	Sulfur Dioxide	mg/m^3	<0.004	<0.004	0.3
4	Total Suspended Particle (TSP)	mg/m^3	0.155	0.207	0.33

(Source: IEIA report, 2011)

Table 12. Air quality in Koh Tas Island

No	Parameters	Unit	Koh Tas Island (2016)	Standard
1	Carbon monoxide	mg/m^3	0.50	20
2	Nitrogen Dioxide	mg/m^3	0.009	0.1
3	Sulfur Dioxide	mg/m^3	0.005	0.3
4	Total Suspended Particle (TSP)	mg/m^3	0.072	0.33

(Source: IEIA report, 2016)

Table 13. Air quality in Koh Pou, Kep

No	Parameters	Unit	Koh Pou	Standard
1	Carbon monoxide	mg/m^3	0.47	20
2	Nitrogen Dioxide	mg/m^3	0.013	0.1
3	Sulfur Dioxide	mg/m^3	0.07	0.3
4	Total Suspended Particle (TSP)	mg/m^3	0.076	0.33
5	Ozone (O_3)	mg/m^3	0.02	< 0.2

(Source: IEIA report, 2017)

C. Biological Resources

1. Protected Areas

50. There are three ecological protected areas near the three subproject areas (Figures 11, 12 & 14). Kep national park and Ream national park are close to Kep and Preah Sihanouk City towns but well away from the subproject areas. Important bird habitat areas exist in Cambodia, which includes Preah Sihanouk province (Figure 13).

51. The tourist pier to be constructed on Koh Touch beach of Koh Rong island (Figures 6 and 14) is outside and below the Island National Park. Koh Rong island is situated in the Koh Rong Marine Protected Area (MPA). However, Koh Touch beach is located inside the "Multiple Use Area" of the MPA (Figure 14) along with the existing government and private piers. The Integrated Biodiversity Assessment Tool (IBAT) used by ADB was applied to the three subproject areas. The output of the software tool (Appendix D) supports the reality that the subproject sites in Kep and in Preah Sihanouk are not inside ecological protected areas. The IBAT tool, however, did not identify the Koh Rong MPA and only referenced the much larger Koh Rong archipelago. Nonetheless the Kong Rong pier site while inside the KR MPA is also situated in the designated multiple use area of the MPA which allows for pier construction.

Figure 11. Kep National Park

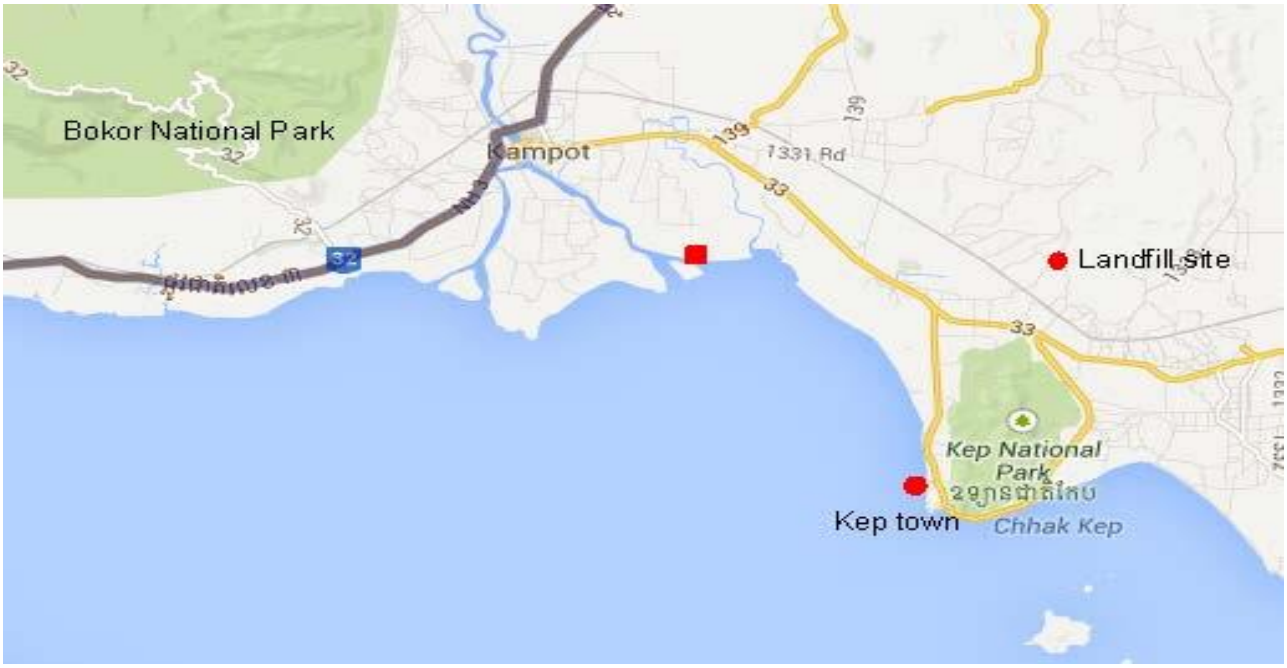


Figure 12. Ream national park near Preah Sihanouk City

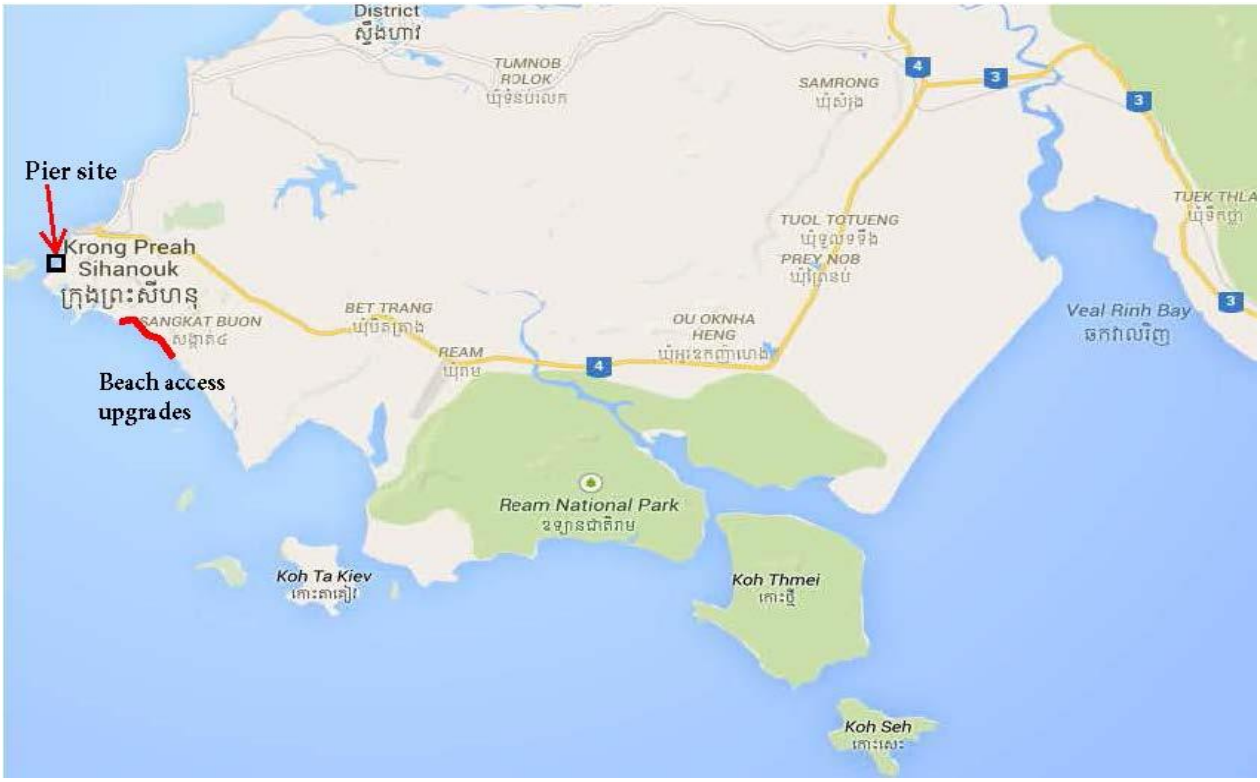
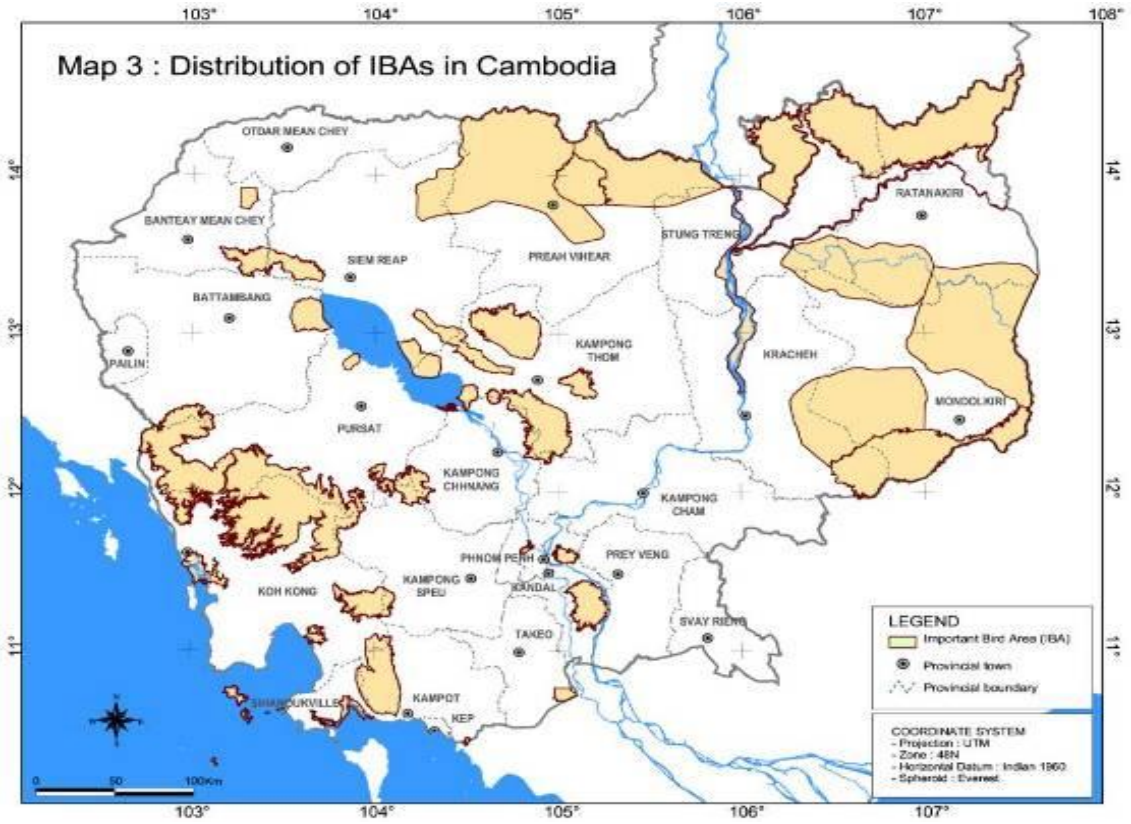
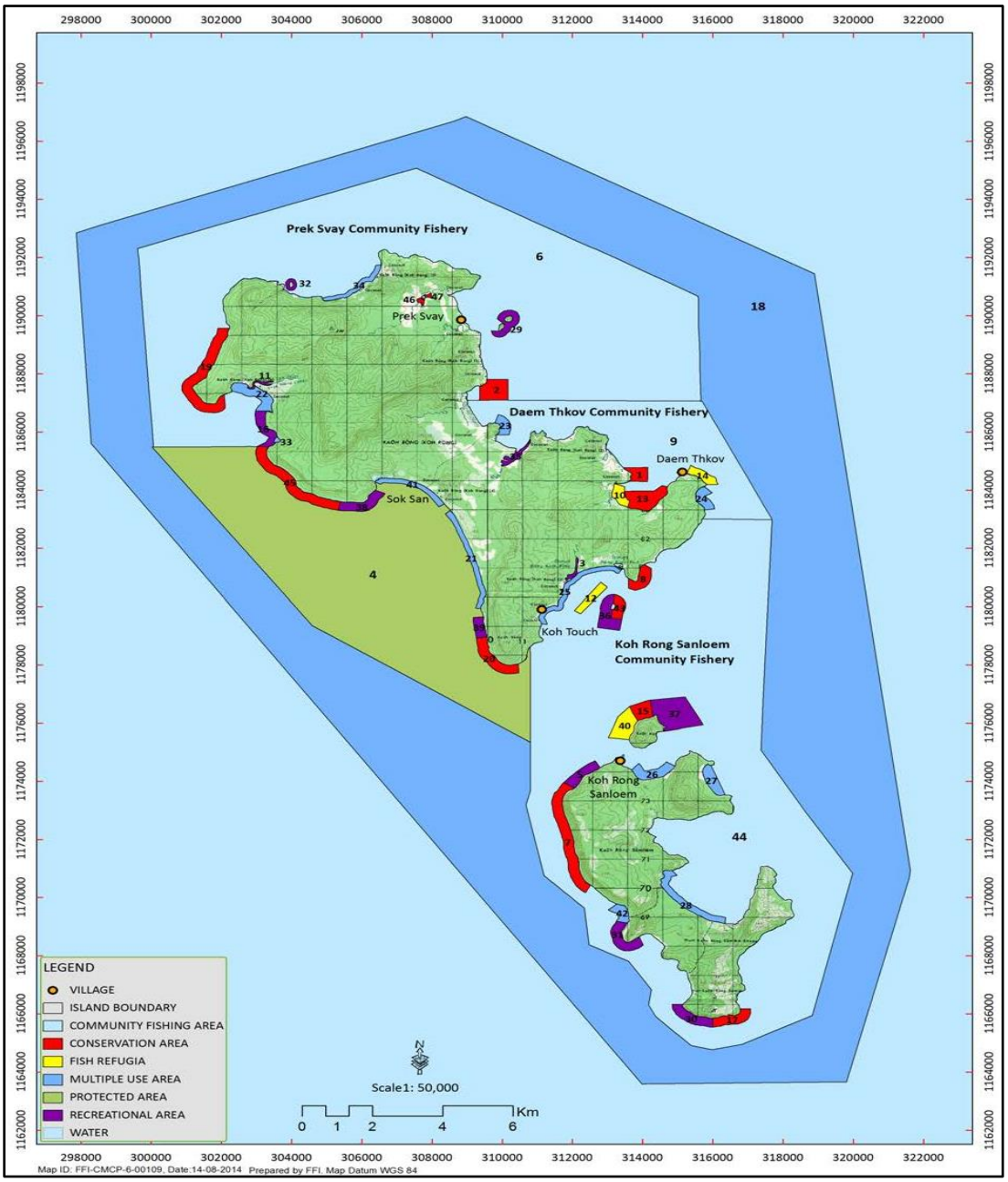


Figure 13. Important Bird areas in national parks near Kep and Preah Sihanouk



Eight 8 Lesser Frigate birds, 1 Bridled Tern and 1 Peregrine Falcon were recorded in the area between Preah Sihanouk City and Koh Rong on 23 February 1999 (BirdLife 2003).

Figure 14. Koh Rong MPA showing multiple-use Koh Touch beach area



D. Marine Coastal Zone of Kep and Preah Sihanouk

52. Cambodia's coastal resources stretching from the Koh Kong province in the west to eastward Preah Sihanouk and to Kep province play an important role in the country's development by supporting the fisheries, aquaculture, agriculture and tourism sectors. Mangroves, seagrass, and corals are important for fisheries and tourism industries. Most

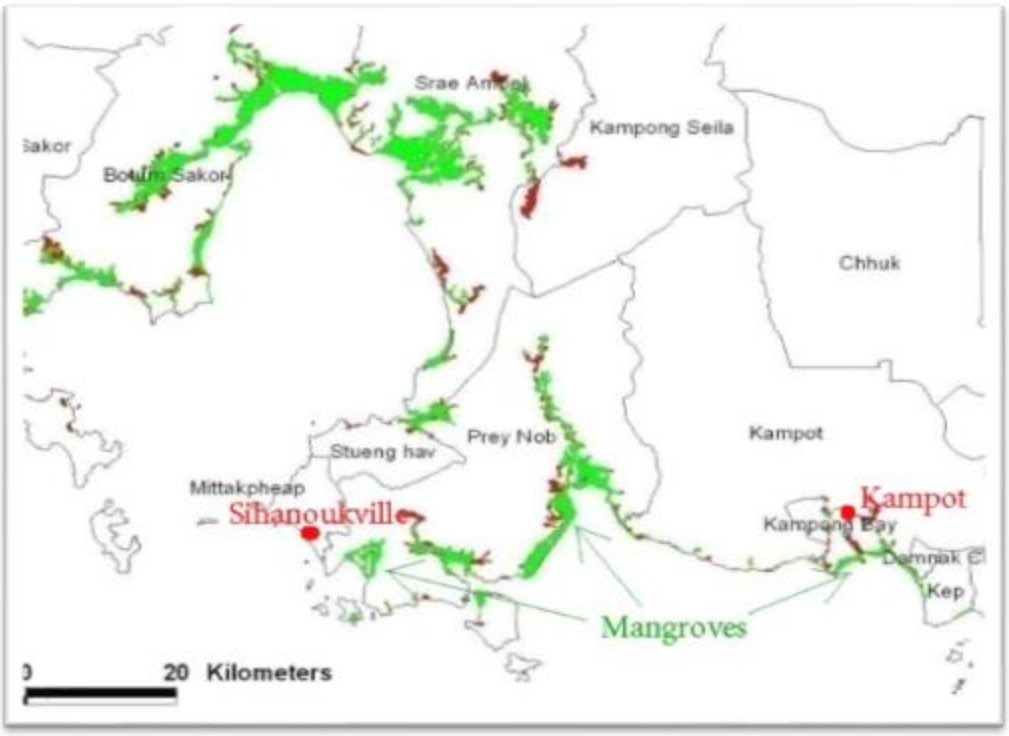
marine resources occur between Koh Kong and Kampot province, where Kep province is located.

1. Mangroves Forests

53. 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. The largest mangrove areas in the subproject areas are situated in Koh Kong province north of Preah Sihanouk, and between Preah Sihanouk and Kep (Figure 15). The remaining mangroves in Preah Sihanouk are situated just west of the town center. Like seagrass, 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 species.

54. Mangroves play an essential role in protecting the coastline 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.

Figure 15. Mangrove distribution from Preah Sihanouk to Kampot/Kep provinces



2. Coral Reefs

55. Cambodia supports an estimated 2,700 ha of coral reefs with the most extensive coverage occurring in off Kampot/Kep and Preah Sihanouk[10] (Figure 16) Approximately 70 coral species are found within the coastal zone, though little is known about the relative

[10] UNEP 2009

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.

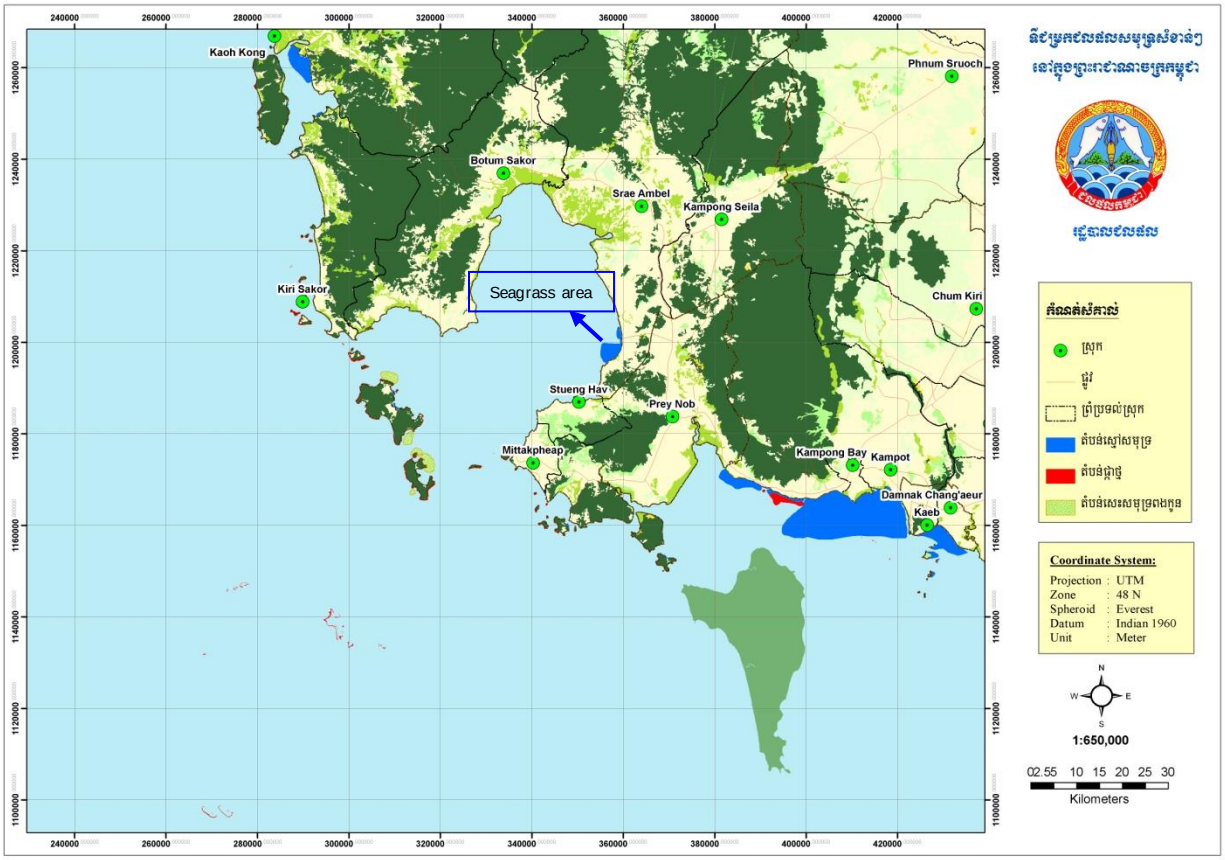
Figure 16. Coral reef distribution along Cambodia's shoreline

3. Seagrass

56. Cambodia's coastal zone supports one of the world's largest areas of seagrass habitat in the shallow nearshore 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 seagrass beds of Kampot/Kep and Preah Sihanouk (Figure 17) and estimated 25,420 ha seagrass habitat off Kampot/Kep is critical habit for inshore and offshore fisheries. There are indications that seagrass 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 Seagrass Management in Cambodia (2006-2015)[12].

[11] UNEP 2009.
[12] MAFF,2006. 'National Action Plan for Coral Reef and Seagrass Management',2006-2015.

Figure 17. Seagrass distribution along Cambodia coast



4. Marine Fisheries

57. Estimates of the average annual catch of fish in Preah Sihanouk province are between 39,500-55,899 tons from 2010 to 2015 (Table 14). Overall fish catch has been increasing since 1980 due to the increase in marine fishers and industrial-scale technologies. The fish catch per unit has been steadily declining, principally due to an increasing coastal population and unrestricted development in ecologically-sensitive habitats.

Table 14. Annual catch (metric tons) from fishing provinces 2010 - 2015.

Year	Kep - Kampot	Preah Sihanouk	Koh Kong	Total
2010	10,591	40,520	34,600	85,711
2011	9,500	39,500	42,000	91,000
2012	11,100	47,800	40,100	99,000
2013	19,500	49,000	41,500	110,000
2014	16,989	55,899	47,739	120,250
2015	18,113	46,830	39,840	104,783

(Source: Fishery Administration, 2016)

58. Estimates (2014) indicate there are more than 416 motorized fishing boats in Kampot. The common groups of fishes caught include finfish, shrimp, and octopus. Coastal fishing communities may be boosted following the advent of Community Fishing Area Management Plans (CFAMP)[13]along the coastline. The plans detail activities and goals for improved resource management and community development but lack baseline information.

5. Status of marine endangered species

59. According to RGC Sub-decree 123, there are 23 endangered species (critically endangered, Endangered and Vulnerable) in Cambodian coastal waters. The presence of these species in the Koh Touch beach subproject area is unknown. At least 10 vulnerable species are protected under IUCN guidelines. There are six species of seahorse (*Hippocampus spp)* found within Cambodia. All six are listed as Vulnerable under IUCN guidelines and included in CITES. Seahorse (*Hippocampus spp)* are listed in RGC Sub decree (12/09/2009) as endangered and are prohibited from extraction.

60. The shoreline of Koh Rong is a nesting site for hawksbill turtle (*Eretmochelys imbricate)* and green turtle (*Chelonia mydas*). Both species are critically endangered and endangered (Mulligan & Longhurst 2014). According to Me'ira Mizrahi et al., turtles are threatened by net fishing, trawling and stingray hooks, and illegal trade.

61. Historical research identified the waters west and south of Koh Rong, including Koh Tang and Koh Polou Wai, as a 'hotspot' for marine mammals. Local reports suggest dolphins are present, however species identification remains unconfirmed (Mulligan & Longhurst 2014). The vulnerable dugong (Dugong dugong) has also historically been sighted on the eastern coast of Cambodia, however recent sightings have been few and anecdotal (Hines et al 2008). The last confirmed sighting of a dugong occurred in 2005. A list of endangered species is found in Table 15.

Table 15. Endangered marine aquatic species of coastal Cambodia

No.	Scientific Name	Common Name	Khmer Name
1	*Crocodylus porosus*	Estuarine crocodile	ក្រពើសមុទ្រ
2	*Dugong dugon*	Dugong	ផ្លែកទឹក ឬពយ៉ុង
3	*Cheilinus undulates*	Humphead Wrasse	ត្រីសេកបូក
4	*Pseudorca crassidens*	False killer whale	ជាឡែនក្របី
5	*Globicephala macrorhynchus*	Short-finned pilot whale	ជាឡែនក្បាលធំ
6	*Tursiops aduncus*	Indo-Pacific bottlenose dolphin	ផ្សោតច្រមុះដបចំពុះខ្លី
7	*Orcaella brevirostris*	Irrawaddy dolphin	ផ្សោតក្បាលក្រឡោក
8	*Tursiops truncatus*	Common bottlenose dolphin	ផ្សោតច្រមុះដបចំពុះវែង
9	*Sousa chinensis*	Indo-Pacific hump-backed dolphin	ផ្សោតឃ្លៀច
10	*Stenella longirostris roseinventris*	Dwarf spinner dolphin	ផ្សោតឆ្នូតភ្នែក
11	*Stenella attenuata*	Pan tropical spotted dolphin	ផ្សោតអុច
12	*Neophocaena phocaenoides*	Finless porpoise	ផ្សោតតាក្រាយខ្នង
13	*Dolphinus capensis tropicalis*	Long-beaked common dolphin	ផ្សោតខ្មៅលឿង
14	*Chelonia mydas*	Green turtle	ល្មិច
15	*Eretmochelys imbricata*	Hawksbill turtle	ក្រាស
16	*Dermochelys coriacea*	Leatherback turtle	ល្មិចព្រុយបី ឬល្មិចស្លឹ
17	*Caretta*	Loggerhead turtle	ល្មិចក្បាលធំ
18	*Lepidochelys olivacea*	Olive ridley turtle	ល្មិចប្រជេះ
19	*Tridacna squamosa*	Fluted giant clam	ត្រំយក្ស

[13] The CFAMPs developed collaboratively by Fisheries Authority and communes. Sor Sarin, DAF pers. comm. 2013

No.	Scientific Name	Common Name	Khmer Name
20	*Tridacna maxima*	Elongate giant clam	ក្រំយក្ស
21	*Tridacna crocea*	Crocus giant clam	ក្រំយក្ស
22	*Tridacna gigas*	Giant clam	ក្រំយក្ស
23	*Trochus niloticus*	Commercial top	ខ្យងកោដ្ឋ
24	*Turbo marmoratus*	Green turbo or green snail	ខ្យងកុជ ឬខ្យងជ្រាក់
25	*Hippocampus* spp.	Seahorse	សេះសមុទ្រ
26	*Anthozoa spp.*	Corals and sea anemones	ផ្កាថ្ម
27	*Tachypleus gigas*	Triangular-tail horseshoe crab	ប្រទាំងកាស
28	*Carcinoscorpius rotundicauda*	Mangrove horseshoe crab	កាចរ
29	*Rhincodon typus*	Whale shark	ត្រីបាណន់តីដ្អក់

E. Land Use & Socio-economy

62. Land use in Preah Sihanouk City and Kep ranges broadly from the urban settlements of each town to mixed agriculture including the salt farms, aquaculture, fishing, and the industrial development zone including Anchor Brewery, and port in western Preah Sihanouk City. Both urban areas rely heavily on tourism.

1. Koh Rong Archipelago

63. Koh Rong archipelago (KRA) comprises Koh Rong (KR) and Koh Rong Sanloem (KRS). There are settlements at Koh Rong Sanloem village on KRS, and Daem Thkov, Prek Svay and Koh Touch villages on KR. The district in which the islands are situated is Mittakpheap which has an estimated total resident population of 1,100. Education levels are relatively high in three out of the four villages (only 3.6% without basic education), with an average of four to five years of primary education. All communities have experienced immigration between 1989-2006, largely due to people either returning from displacement under the Khmer Rouge regime or migrating from other provinces in search of better livelihood opportunities such as fishing (Mulligan & Longhurst 2014).

64. Infrastructure is still relatively underdeveloped, although road networks are increasing, as are the development of tourism facilities such as holiday resorts. Currently, no grid electricity supply exists on the islands although generators are run by more affluent community members. Boats are the most dominant means of transport.

65. Approximately 2,643 island inhabitants within the KRA depend heavily on the service industry -tourism- (71 %) and fishing (11.3%) particularly for crab and squid for their livelihood (Sangkat Koh Rong, 2015). Most of this catch (over 50%) is sold to traders and subsequently sold on the regional, national and international market. Some, particularly finfish and squid, is sold locally (Leng et al 2015).

66. The KRA has six different allocated zones to protect sensitive habitats. These confine intensive fishing and other usage to sites that can sustain it, and separate incompatible activities to reduce conflicts. The spectrum of zonation includes zones under strict, no-take protection, to general-use zones with fewer restrictions. Regulations for the Marine Fisheries Management Area (MFMA) of the Koh Rong Marine Protected Area (MPA) are summarized in Table 16. The MFMA is managed by the Fisheries Administration of MAFF.

Table 16. Koh Rong Archipelago Management Zones*

1. **Conservation Area:** potential area for aquatic animals and aquatic plants to shelter, to spawn, feed, and grow. Fisheries Conservation Areas are strictly prohibited any activity that has a negative effect on fishery resources, except for permitted scientific research purposes from Ministry of Agriculture, Forestry and Fisheries.

2. **Fisheries Protected Area**: near or close to fisheries conservation area, to secure the sustainability of the fisheries resource. Fisheries Protected Areas can be used for ecotourism activities, family scale fishing or recreational fishing that will not harm to coral reef or biological resources.

3. **Community Fisheries Area:** fisheries domain of the state, handed over to the community fishery under the agreement between the Chief of Cantonment of the Fisheries Administration and the communities or group of citizens living inside or around the fishery domain. Those citizens are mainly dependent on fishing for their daily life and use traditional fishing gears. They manage or use the Community Fishing Areas sustainably. Fishing activity operating inside the CF area can be operating all seasons by using family fishing gear.

4. **Fisheries Refuge:** specific area for one or more aquatic species in the period of critical live cycle. Fishing and other activities inside fisheries refuge as are strictly prohibited during the protected period. However, family fishing activities and other activities, which are not harmful to fisheries resources, are allowed as usual, after the Protected Period. Protected periods will vary in timeframe, and are catered to each Fisheries Refuge to reflect the species biology and habitat unique to that area.

5. **Recreational and Research Area**: area where important function for serving recreational activities and protection of biodiversity resources for ensuring benefit from tourist and sustainable fisheries resources. This area is allowed for recreational diving, snorkeling to view coral and other fisheries resource with responsible and for collecting scientific information and monitoring resources change/trend. All kind of fishing activities are banned inside this area.

6. **Multiple Used Area:** identified outside conservation, protection, fisheries community and fisheries refuge. This area is allowed for construction or other activities that is not harmful to fisheries resources and allowed for small scale and medium scale fishing activities, excepted trawling net.

* *Source*: MAFF Fisheries Administration.

F. Features of subproject affected areas

67. The area influenced[14] by subprojects in Kep province and Preah Sihanouk are shown in Figures 18 – 20. Kep Solid Waste Management subproject is defined by a relatively isolated dumpsite. The environmental quality of Kep urban-suburban areas will be influenced by improvements to Kep solid waste management. The target impact of the subproject is defined by a cleaner and healthier urban and peri-urban Kep environment. The Kep crab market and nearby beach hotels will benefit directly from improved solid waste management. Indirectly, improved solid waste management should increase tourism in the town and vicinity and strengthen the

[14] As per SPS (2009), Appendix 1, para 6

urban socioeconomy. There are no facilities associated with the existing dumpsite. The nearest building to the dumpsite is a single building located about 700m south in a mango plantation which is used as a guard post for the plantation. Homesteads exist on the access road to the landfill located greater than 2 km from the dumpsite. There are casual day waste pickers at the dumpsite who transport their recycled material to Kep town. There are no buildings on the landfill site and it was confirmed that the waste pickers live off-site.

Figure 18. Existing dumpsite north of Kep town.

Figure 18a: Access road into dumpsite north of Kep town.

Figure 18b: Dumpsite north of Kep town.

68. The new pier sites on Koh Touch beach of Koh Rong island and Victory beach in Preah Sihanouk City are shown in Figure 19. Koh Rong piers will be constructed beside (east) three

existing piers (Figure 6). The area directly affected by the new pier and associated facilities on Koh Rong island is restricted to the footprint of the new 750m^2 pier and the immediate tourist area and facilities on Koh Touch beach where the new pier will be constructed. The improved pier and facilities will allow more tourist movement to/from the island which will strengthen tourism and the local socioeconomy. Because the Koh Touch beach acts both as a destination and stopping off point for other island destinations, the greater tourist movement capacity and cleaner environment at Koh Touch beach should also indirectly positively affect the other destinations on Koh Rong island, and nearby islands. There are no associated facilities with the subproject.

69. Similarly, the area directly affected by the new pier on Victory beach in Preah Sihanouk City has a 600m^2 pier footprint, parking lot, and short access road. However, the indirectly affected area is the Preah Sihanouk City beachfront area and offshore areas which will be serviced by more tourist boats from the new pier. The piers on Koh Rong island and Preah Sihanouk City will increase the capacity of tourist movement to/from the nearby islands and mainland Preah Sihanouk City which will stimulate the local socio-economy.

Figure 19. Sites for new piers on Koh Rong island & Victory Beach

Figure 19a: Site of new pier on Koh Rong with existing piers on left.

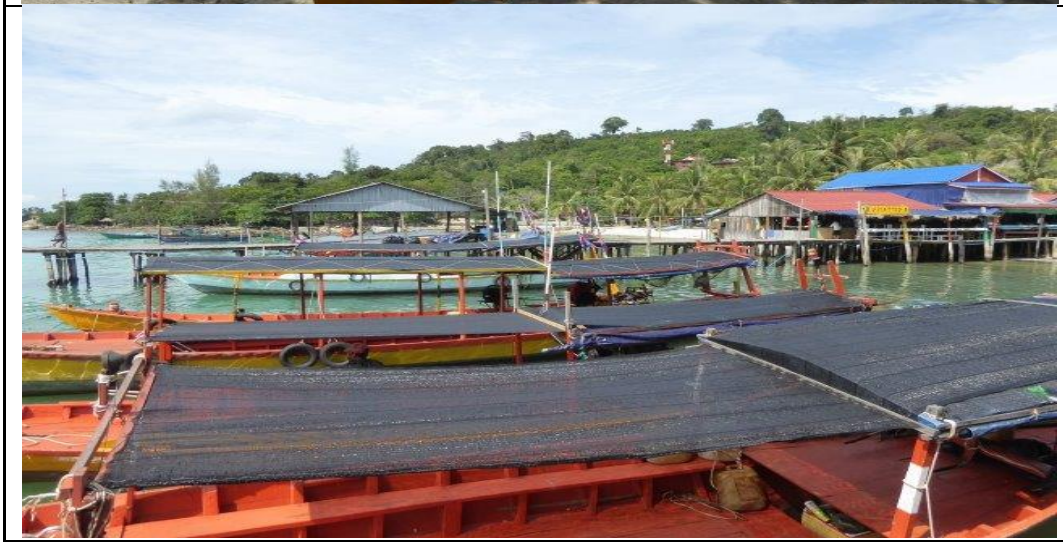


Figure 19b: Looking east on Koh Rong island from private pier across to government pier to new pier site in background.

Figure 19c: Site of new pier on Victory beach, Preah Sihanouk City

70. The improvements to beachfront roads including drainage, landscaping, and tourist services along Otres and Ocheuteal beaches will have direct and indirect benefits to the beach areas. The impact footprints of the beachfront roads exist so the impact of the upgraded roads and improved tourist services will be restricted to improvements to tourist access and movement along the beaches which will foster tourism development along the roads. The new footpath connection between Otres and Ocheuteal will expand the scope of beach area that can be accessed easily by tourists. The direct effects will be benefits to tourist shops, restaurants and businesses along the beachfront Indirect effects of the subproject will be general tourism development in the area.

Figure 20. Sections of Ocheutal and Otres beach roads to be upgraded.

V. POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATIONS

71. The assessment of potential impacts is structured by the three development phases: a) *pre-construction; b) construction;* and c) *post-construction operational* to distinguish the important impact periods of subproject implementation, and to prevent redundancy in the assessment and reporting. This assessment structure is carried forward and is used to structure the environmental management plans (EMP) prepared for the subprojects.

72. To further prevent redundancy in the assessment potential impacts that are common to all subproject components are identified and discussed together. This enables clearer assessment and discussion of subproject component – specific potential impacts.

A. Subproject Benefits

73. The environmental benefits of the subprojects which also reflect input from the public consultations, are summarized below:

1. Kep Solid Waste Management Improvements

74. The existing arrangements for solid waste management in Kep are inadequate, characterized by low coverage, lack of sanitation awareness, and an open, unmanaged dumpsite. The subproject will address these problems by expanding the quality and coverage of solid waste collection and treatment services, upgrade the dumpsite to a managed landfill (9ha) on public land, and support sanitation and waste management awareness programs. The upgraded solid waste management system will increase, and make more efficient solid waste removal from the streets and beach areas in Kep.

75. The upgraded landfill and MRF will also reduce pollution at the landfill site and along the access road to the landfill. The managed network of modern waste cells overlying an impermeable liner, leachate collection and recycling, and gas capture and flaring at the landfill will protect groundwater, improve air quality, and reduce blowing solid waste at the site thereby improving the natural environment and working conditions of the waste pickers. The provision of new waste compactor trucks will prevent spillage of garbage along the access road to the landfill and odor that was reported by residents along the road during the public consultations.

76. The upgraded solid waste management system will assist implementation of the sub-decree on Solid Waste Management (April 1999). The sub-decree provides technical standards for all activities related to disposal, storage, collection, transportation, recycling, dumping of municipal and hazardous waste. The subproject will benefit Kep urban core with a residential population of 9,000, 95 hotels, 52 restaurants/cafes, and various other commercial outlets.

a. Materials Recovery Facility

77. The materials recovery facility (MRF) to be constructed at the upgraded landfill in Kep will organize, make safer and make more efficient the current limited practice of solid waste recycling that is occurring at the existing dumpsite. The MRF will improve and make more sanitary the working conditions of garbage pickers while improving the efficiency and opportunities for he reduction, recycling and reuse of solid waste. The MRF together with necessary local ordinances on waste collection and segregation will increase recyclables recovery using sanitary facilities and practices.

b. Septage Treatment Facility

78. The septage treatment facility (STF) at the upgraded landfill will contribute to overall environmental improvement in Kep town, and especially the crab market, by providing a location for septic tank sludge to be deposited and treated safely.

2. Preah Sihanouk Seaside Access and Environmental Improvements

79. Preah Sihanouk received 2.1 million visitors in 2016 and forecasts suggest visitor arrivals could rise to almost 4 million in 2026. Weak planning and ad hoc development of Ocheuteal and Otres beaches has led to poor pedestrian access, traffic congestion, unsanitary drainage with intermittent flooding, and lack of public amenities. This situation creates public health hazards for residents and tourists, deters private investment, and puts future tourism growth at risk.

80. In addition to about 7 km of roads, drainage, and sidewalk improvements, and improvements to pedestrian and vehicular access to the beaches, the subproject will improve the tourist experience and comfort by providing 12, 35m^2 public toilet blocks with showers.

Implementation of the subproject will be coordinated with the ADB-financed Second Corridor Towns Development Project and Provincial Water Supply and Sanitation Sector Project to ensure that all road improvements are properly sequenced with planned installation of sewage trunk lines, pumping stations, and residential connections. The subproject will benefit 41 hotels with 2,167 bedrooms, 240 restaurants, other commercial premises, and 12,878 residents.

3. Preah Sihanouk City–Koh Rong Passenger Piers Improvements

81. The proposed new pier at Victory beach (Preah Sihanouk City mainland) at Koh Touch beach (Koh Rong island) will address current problems of overcrowding at existing structurally unsound piers in Preah Sihanouk City and Koh Rong. The provision of toilets at both piers and parking at Victory beach pier will also improve environmental management and the tourist experience. The new piers will reduce the chronic congestion, and hazardous conditions for passengers and boat operators that negatively affect shorefront environment. The planned 850m-long 2m-wide concrete walkway linking the commercial area at Koh Touch beach with the island pier will improve drainage and pedestrian safety along the beach. The subproject will benefit 38 ferry boat operators, 31 associated business operators, and about 438,000 passengers during the first year of operation.

B. Subproject Impacts and Mitigations

1. Pre-construction Phase

82. The pre-construction phase begins with the completion of the detailed, final designs of the subprojects. The final subproject designs, amongst tourism infrastructure and engineering needs, will consider social and environment impacts, and requirements for subproject resilience to climate change. The sensitive social and environmental receptors and the climate change resilience measures identified in the Climate Risk and Vulnerability Analyses report and summarized in this IEE will be reviewed as part of the detailed design to ensure potential impacts are not missed if the subproject locations or designs are changed.

83. Potential negative impacts associated with the pre-construction phase of the subprojects concern land acquisition. The only subproject with expected land acquisition is Preah Sihanouk Seaside Access and Environmental Improvements in Preah Sihanouk province. The details of any required land acquisition and resettlement are addressed in the Resettlement Plan (RP) and Inventory of Losses (IoL) that have been prepared separately. The RP includes a grievance redress mechanism and resettlement budget covering the direct compensation costs, implementation costs, and contingencies.

a. Unexploded ordnance (UXO)

84. A critical activity that must occur before any civil works or excavation activity begins is the three subproject areas - specifically all excavation sites, must be visited and reviewed by the military to ensure all potential sites containing UXO are cleared. The EA/IU/PIU will coordinate required UXO identification and clearing with the military.

b. Environmental Compliance Audit of Kep dumpsite

85. An environmental compliance audit (ECA) of the Kep dumpsite must be prepared because the dumpsite is an "*existing facility"* as defined by the SPS (2009). The terms of reference for the

ECA are appended to the IEE (Appendix C). The status of groundwater and soil must be determined for the design of the liner of the upgraded landfill. Thus, as part of the ECA, the soil type and porosity, and the depth of the water table will need to be clarified. A local groundwater and soils investigation will be needed for the landfill upgrade during the pre-construction-detailed design phase. As part of the groundwater study bore holes should be drilled around and downslope below the dumpsite to determine aerial extent, if any, of leachate contamination of groundwater, and to monitor effectiveness of the upgraded landfill. Groundwater quality can be sampled at an existing well if close to dumpsite, (e.g., a house is located about 800 m southwest of dumpsite on access road). A draft ToR for a groundwater study at the landfill north of Kep is provided in Appendix B.

c. Updating EMPs

86. The EMPs for the Kep and Preah Sihanouk subprojects will need to be updated during the pre-construction detailed design stage to ensure the EMPs align with the final detailed designs. This will involve finalization of the mitigation sub-plans to manage potential impact areas such as erosion, sedimentation of surface waters, noise, dust and air quality, spoil disposal, traffic, UXO clearance, and worker and public safety at the project sites. The two EMPs set out mitigation and monitoring measures for each phase of the project.

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

1) Initiation of the project's resettlement and/or compensation plan, and GRM;
2) Groundwater and soils investigation and ECA at Kep dumpsite site;
3) Completion of detailed designs of the subprojects; and
4) Updating the IEE and EMPs.

88. Updating the IEE and EMPs involves updating the environmental baseline descriptions of affected areas where needed to better understand potential impacts of subprojects and to maximize effectiveness of required mitigations. The results of the groundwater and soils investigation analysis and ECA should be added to the environmental baseline and any corresponding mitigation measures integrated in the detailed design and/or EMP requirements. Updated EMPs to be included in the bid documents for works and requirements in the contract documents. The updated IEE should be disclosed on ADB website prior to contract award. The IEE will also need to be approved by the EIA Department of the MOE during detailed design prior to initiation of any civil works. The final IEE, to be prepared based on the landfill's detailed, and the updated EMP will serve as the corrective action plan for the ECA.

2. Construction Phase

a. Common potential impacts of components of subprojects

89. Potential environmental impacts of the three subprojects occur during construction phase from short-term disturbances and impacts caused by the construction of individual subproject components. Common impacts of the civil works will consist of for example, reduced and/or blocked public access to areas, disrupted business and recreation, noise, dust 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 congestion and traffic accidents, land erosion and shoreline sedimentation at the sites of the two piers, localized drainage and flooding problems, solid waste and domestic pollution from worker camps, and communicable diseases and other social problems caused by migrant workers. These short-

term impacts and disturbances will occur at different levels of magnitude depending on the civil works activity and the subproject site.

i. Mitigation measures

90. Management measures to mitigate common potential impacts associated with the construction phase of subproject components are presented below. The mitigation measures are detailed further in the subproject EMPs.

91. The common mitigation measures below will be applied as appropriate in the two provincial EMPs for the three subprojects. These generic construction mitigation measures are comprehensive at the feasibility design stage to ensure that a mitigation measure for the impact of a final design feature whether the Kep landfill, a pier, a road or associated facilities is not overlooked during the detailed design stage. The contractors will be required to include these measures in their site-specific construction EMPs (CEMPs) which will be submitted to the project management and civil engineering support consultant (PMCES) and the PMUs for review and approval prior to construction. Monitoring will be carried out by the PMCES during the construction period.

92. **Air pollution control**. Contractors shall include all necessary measures to prevent or minimize air pollution and dust development by implementing the following air quality control measures. Most of these generic measures are applicable to all construction sites and construction activities as good practice, and are also described in the World Bank Group's EHS guidelines.

(i) Build access and aggregate hauling roads at sufficient distances from residential areas, especially schools and hospitals.
(ii) Assign haulage routes and schedules to avoid transport occurring in the central areas, traffic intensive areas, or residential areas. For the areas with high-demand for environmental quality, transport should be arranged at night.
(iii) Spray water or other wetting agents such as calcium chloride ($CaCl_2$) regularly on unpaved haul roads and access roads (at least once a day) to suppress dust; and erect hoardings around dusty activities.
(iv) Cover material stockpiles with dust shrouds or tarpaulin. For the backfill earthwork management measures will include surface press and periodic spraying and covering. The extra earth or dredge material should be cleared from the project site in time to avoid long term stockpiling.
(v) Minimize the storage time of construction and demolition wastes on site by regularly removing them off site.
(vi) Site asphalt mixing and concrete batching stations at least 300 m downwind of the nearest air quality protection target.
(vii) Equip asphalt, hot mix and batching plants with fabric filters and/or wet scrubbers to reduce the level of dust emissions.
(viii) Install wheel washing equipment or conduct wheel washing manually at each exit of the works area to prevent trucks from carrying muddy or dusty substance onto public roads.
(ix) Keep construction vehicles and machinery in good working order, regularly service and turn off engines when not in use.
(x) Vehicles with an open load-carrying case, which transport potentially dust-producing materials, shall have proper fitting sides and tail boards. Dust-prone materials shall not be loaded to a level higher than the side and tail boards, and shall always be

covered with a strong tarpaulin.

(xi) In periods of high wind, dust-generating operations shall not be permitted within 200 m of residential areas. Special precautions need to be applied near sensitive receptors such as schools, kindergartens and hospitals.

(xii) To avoid odor impacts caused by shoreline sediment dredging for pier or bridge foundations, transport dredged sediment in closed tank wagons to contain odor and prevent scattering along the way.

(xiii) Unauthorized burning of construction and demolition waste material and refuse is prohibited.

93. **Construction noise**. Contractors will be required to implement the following mitigation measures for construction activities to meet Cambodian and IFC/WHO recommended environmental noise standards and to protect sensitive receptors. Some measures are generic and are applicable to all construction sites and activities. They represent good practice and are effective measures and are in line with IFC's EHS guidelines.

(i) During daytime construction, the contractor will ensure that: (1) noise levels from equipment and machinery conform to the IFC EHS Standards, and properly maintain machinery to minimize noise; (2) equipment with high noise and high vibration are not used near residences and only low noise machinery or the equipment with sound insulation is employed; (3) sites for concrete-mixing plants and similar activities will be located at least 300 m away from the nearest noise protection target; and (4) temporary noise barriers or hoardings will be installed around the equipment to shield residences when there are residences within 20 m of the noise source.

(ii) No construction should be allowed between the night time hours of 20:00 to 07:00.

(iii) Regularly monitor noise levels at construction site boundaries. If noise standards are exceeded by more than 3 dB, equipment and construction conditions shall be checked, and mitigation measures shall be implemented to rectify the situation.

(iv) Provide the construction workers with suitable hearing protection (ear muffs) according to the worker health and safety requirements of Cambodia.

(v) Control the speed of bulldozer, excavator, crusher and other transport vehicles travelling on site, adopt noise reduction measures on equipment, step up equipment repair and maintenance to keep them in good working condition.

(vi) Limit the speed of vehicles travelling on site (less than 8 km/h), forbid the use of horns unless absolutely necessary, minimize the use of whistles.

(vii) Maintain continual communication with the villages and communities near the construction sites, and avoid noisy construction activities during school examination periods.

94. **Surface water & coastal pollution**. The contractors will implement the following measures to prevent water pollution:

(i) Portable toilets and small package wastewater treatment plants will be provided on construction sites and construction camps for the workers and canteens. If there are nearby public sewers, interim storage tanks and pipelines will be installed to convey wastewater to those sewers.

(ii) Sedimentation tanks will be installed on construction sites to treat process water (e.g. concrete batching for bridge construction) and muddy runoff with high concentrations of suspended solids. If necessary, flocculants such as polyacryl amide will be used to facilitate sedimentation.

(iii) Construction machinery will be repaired and washed at special repairing shops. No

onsite machine repair and washing shall be allowed.

(iv) Material stockpiles will be protected against wind and runoff waters which might transport them to surface waters.

(v) Dedicated fuel storage areas must be established away from public areas and marked clearly.

(vi) Storage of bulk fuel should be on covered concrete pads away from the public and worker camp, and 300m from surface waters. 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.

(vii) Mitigation of water quality impacts during bridge and pier construction will be based on water quality monitoring results.

(viii) 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.

95. **Earthworks & soil erosion mitigation**. The contractors will implement the following measures related to earthwork management:

(i) Present and past land use should be reviewed to assess whether excavated soils are contaminated spoil. Contaminated spoil should be disposed at a nearby landfill or a location approved by DOE.

(ii) Confirm location of the borrow pit and temporary spoil storage and final disposal sites, securing permits from relevant DOE.

(iii) Develop borrow pit and spoil disposal site management and restoration plan, to be approved by responsible authority; obtain permit for the clearance of excavated earthworks.

(iv) Construct intercepting ditches and drains to prevent runoff entering construction sites, and diverting runoff from sites to existing drainage.

(v) Construct hoardings and sedimentation ponds to contain soil loss and runoff from the construction sites.

(vi) Limit construction and material handling during periods of rains and high winds.

(vii) Stabilize all cut slopes, embankments, and other erosion-prone working areas while works are going on.

(viii) Stockpiles shall be short-termed, placed in sheltered and guarded areas near the actual construction sites, covered with clean tarpaulins, and sprayed with water during dry and windy weather conditions.

(ix) All earthwork disturbance areas shall be stabilized with thatch cover within 30 days after earthworks have ceased at the sites.

(x) Immediately restore, level and plant landscape on temporary occupied land upon completion of construction works.

(xi) Implement all soil erosion protection measures as defined in the soil and water conservation reports.

96. **Ecological impacts**. The contractors will implement the following measures to prevent ecological impact during construction:

(i) Preserve existing vegetation where no construction activity is planned.

(ii) Protect existing trees and grassland during construction; where a tree must be removed, or an area of grassland disturbed, replant trees and re-vegetate the area after construction.

(iii) Remove trees or shrubs only as the last resort if they impinge directly on the

permanent works or necessary temporary works.

(iv) Prior to commencement of construction, tag and conspicuously mark all the trees to be preserved to prevent damage to these trees by construction workers.

(v) Construction workers are prohibited from capturing any wildlife in the project areas.

97. **Occupational health and safety**. The construction industry is considered hazardous. The civil works contractors will implement adequate precautions to protect the health and safety of construction workers and the public. Contractors will manage occupational health and safety risks by applying the following measures:

(i) Care must be taken to ensure that sites for all earthworks (e.g., excavations, trenches) and dredging that are suspected to have unexploded ordnance (UXO) are surveyed by the military prior to construction. If such ordnance is detected clearing work will need to be commissioned prior to undertaking civil works.

(ii) Construction site sanitation: (1) Each contractor shall provide adequate and functional systems for sanitary conditions, toilet facilities, waste management, labor dormitories and cooking facilities. Effectively clean and disinfect the site. During site formation, spray with phenolated water for disinfection. Disinfect toilets and refuse piles and timely remove solid waste; (2) Exterminate rodents on site at least once every 3 months, and exterminate mosquitoes and flies at least twice each year; (3) Provide public toilets in accordance with the requirements of labor management and sanitation departments in the living areas on construction site, and appoint designated staff responsible for cleaning and disinfection; (4) Work camp wastewater shall be discharged into the municipal sewer system or treated on-site with portable system.

(iii) Occupational safety: (1) Provide safety hats and safety shoes to all construction workers; (2) Provide safety goggles and respiratory masks to workers doing asphalt road paving and tunnel blasting; (3) Provide ear plugs to workers working near noisy PME.

(iv) Food safety: Inspect and supervise food hygiene in canteen on site regularly. Canteen workers must have valid health permits. Once food poisoning is discovered, implement effective control measures immediately to prevent it from spreading.

(v) Disease prevention, health services: (1) All contracted labor shall undergo a medical examination which should form the basis of an (obligatory) health/accident insurance and welfare provisions to be included in the work contracts. The contractors shall maintain records of health and welfare conditions for each person contractually engaged; (2) Establish health clinic at location where workers are concentrated, which should be equipped with common medical supplies and medication for simple treatment and emergency treatment for accidents; (3) Specify (by the PIUs and contractors) the person(s) responsible for health and epidemic prevention responsible for the education and propaganda on food hygiene and disease prevention to raise the awareness of workers.

(vi) Social conflict prevention: No major social risks and/or vulnerabilities are anticipated because of the project. The project construction workers will be engaged locally. Civil works contracts will stipulate priorities to (1) employ local people for works, (2) ensure equal opportunities for women and men, (3) pay equal wages for work of equal value, and to pay women's wages directly to them; and (4) not employ child or forced labor.

98. **Community health and safety**. Temporary traffic diversions, continual generation of noise and dust on hauling routes, and general hindrance to local accesses and services are common impacts associated with construction works within or nearby local settlements. The

project may also contribute to road accidents by heavy machinery on existing roads, temporarily blocking pavements for pedestrians etc. The potential impacts on community health and safety will be mitigated through many activities defined in the EMPs. The contractors will implement the following measures:

(i) Temporary traffic management: A traffic control and operation plan will be prepared together with the local traffic police prior to any construction. The plan shall include provisions for diverting or scheduling construction traffic to avoid morning and afternoon peak traffic hours, regulating traffic at road crossings with an emphasis on ensuring public safety through clear signs, controls and planning in advance.

(ii) Information disclosure: Residents and businesses will be informed in advance through media of the construction activities, given the dates and duration of expected traffic disruption.

(iii) Construction sites: Clearly marked signs will be placed at construction sites in view of the public, warning people of potential dangers such as moving vehicles, hazardous materials, excavations etc. and raising awareness on safety issues. Heavy machinery will not be used at night and all such equipment will be returned to its overnight storage area/position before nightfall. All sites will be made secure, discouraging access by members of the public through appropriate fencing whenever appropriate. Open excavations should be fenced, and trenches covered where public walkways or vehicles must cross.

b. Construction of Kep solid waste management improvements

99. The temporary environmental impacts of the construction phase to improve solid waste management in Kep will primarily occur from the civil works at the dumpsite, and from the civil works required to upgrade the access road to the landfill. Of particular importance is the potential risk of injury or disruption of normal work activity of three waste pickers who currently work part-time at the dumpsite, and who travel along the access road to the dumpsite. The social team determined that the three waste pickers spend little time at the dumpsite because most of the sorting of recyclables is done in Kep before the solid waste is transferred to the dumpsite. Nonetheless, the safety and continued ability of the waste pickers to work during construction of upgraded landfill will be managed as part of the transition to the new MRF.

100. Noise and disturbance mitigation measures consist of well-maintained vehicles and machinery that are not used between 20:00 and 07:00; dust and regular use of wetting agents (e.g., water $CaCl_2$) and careful covering of all excavate or aggregate piles. Increased traffic congestion and risk of traffic accidents, and well signed construction areas, enforced speed limits, and special temporary pedestrian walkways and vehicle road lanes. Local pollution from the exhaust of trucks and heavy equipment can be minimized by ensuring all vehicles and equipment is kept in good working order and left idling for extended periods. Solid and domestic construction waste to be managed with a formal waste management plan that creates solid waste depots that are disposed of regularly according to the DOE. Pit latrines for workers should be placed away from public areas including eating/sleeping areas of temporary worker camps, and limed regularly. When worker camps close latrines are to be buried according to direction from DOE. All construction sites must have clearly marked telephone hot line phone numbers to the PIU as part of the GRM (Appendix B) for the subprojects. Civil works on the access road should be conducted between 07:00 and 20:00. Households along the access road should be given regularly updated construction schedules and locations where heavy (noisy) equipment will be operated. The civil works schedules must include the periods when specific road sections may be partially blocked creating travel impediments must be identified.

101. The first major step toward the physical upgrading of the dumpsite is to bulldoze and consolidate the existing waste field into appropriately sized area(s), and covered, or conversely, excavated in whole or part and disposed of in a new unused cell of the upgraded landfill. Management of leachate is not anticipated because it is assumed the upper layers of the relatively thin waste field will be dry. The consolidated waste must be covered with a sufficient layer of natural material with the planned gas capture technology.

102. Further to above, the public must be kept out of the existing dumpsite area during construction, with well signed fencing. Only regular solid waste disposal should occur, and to a specially allocated area in dumpsite.

103. The ECA of the existing dumpsite, which is based on the IFC EHS Guidelines for Solid Waste Management Facilities will provide valuable information on the environmental status of the existing site which will assist with the detailed design of the upgraded landfill and impact mitigation measures during construction and operation phases. The general civil works impact mitigations listed above apply as appropriate, with the addition of the following key mitigations:

- The ECA and groundwater and soils investigation in Appendix C should be implemented as part of feasibility design ahead of the initiation of the pre-construction phase.
- Using the results of the groundwater investigation (Appendix B), excavations of cells should not penetrate the water table.
- By design, a modern liner should be installed under each landfill cell including the medical waste and septage treatment cells.
- The gas capture technology should be suitable for the type of waste to be deposited in the landfill.
- The capacity of the peripheral surface runoff drainage network to be installed should be sufficient for extreme rainfall projections.
- The leachate capture and disposal design whether by treatment or simple distribution on top of newly deposited/covered waste should meet the production capacity of the landfill.

c. Construction of Preah Sihanouk subprojects

Preah Sihanouk Seaside Access and Environmental Improvements.

104. The upgrading of the existing access roads, foot paths, and supporting drainage of Ocheuteal and Otres beaches along with the construction of public toilets and showers represents mild road and small building construction interventions with respect to environmental impacts. The same short-term impacts and disturbances caused by road corridor developments and large building construction of noise, dust, solid and domestic waste production, traffic congestion and increased risk of traffic accidents, restricted access, soil erosion and surface water (shoreline) sedimentation, drainage and flooding, and contaminated soil from oil, grease and gas, and possible damage to physical cultural or heritage resources will potentially occur but they will occur at a much smaller magnitude. The planned road and footpath upgrades are relatively minor, and the shower and toilet facilities are small structures. The implementation of the road/path and drainage components will be coordinated with the implementation of Second Corridor Towns Development Project and the Provincial Water Supply and Sanitation Sector Project.

105. General impact mitigation measures normally applied to road works summarized above will be applied at Otres and Ocheuteal beach. A major focus of the impact mitigation will be

avoiding or minimizing any disruption or interference of the heavy tourist activities along the beaches. As such a well-marked public telephone hotline to the PIU will be posted at all construction sites as part of the GRM.

Preah Sihanouk City–Koh Rong Passenger Piers Improvements

106. The potential construction impacts and disturbances of the shoreline and nearshore activities of the two pier subprojects summarized below are common to the short-term construction impacts and disturbances that will be caused by the seaside access improvements at Otres and Ocheuteal beaches subproject in Preah Sihanouk City. The disturbances of noise, dust, traffic congestion, and construction waste will occur from the upgrade to the Kep landfill.

i. Aquatic wildlife habitat

107. Construction of new coastal piers temporarily destroys or disrupts the benthic community of plants and animals because the construction of foundations and pile driving damage or destroy benthic habitats on which fish communities depend for food and reproduction. Pier construction also re-surfaces anoxic sediments which degrades water quality. The impacts will be minor because the piers sites are located over large sandy beach deposits which naturally are least productive coastal areas as opposed to the coral reef, mangrove, and sea grass areas of Preah Sihanouk and Kep.

Mitigation

108. For all pier works vehicles should be kept out of the pier construction. Infilling along shorelines should be avoided or minimized. Silt curtains should be placed around entire pier construction area to contain sediment, and minimizing exposure of aquatic biota and habitat to transported and deposited silt.

ii. Terrestrial habitat

109. The impact to terrestrial environments from pier developments arise from the land-based associated support facilities. Specifically, the cleared footprints of the walkways and promenades to the piers, service buildings such as tourist information centers and shelters, and bathrooms, parking lots, and access roads. However, the extent of terrestrial impacts from the two piers will be minimal because the coastal sites have already been mostly cleared by previous activities. The extent of tree loss will be greatest at Victory Beach site. There are no rare and endangered terrestrial wildlife that will be affected by the pier developments.

Mitigation

110. The removal of vegetation from shorelines should be avoided, or at least minimized. If vegetation is removed for the pier facilities, it should be replaced with local like-for-like species, or with more robust vegetation varieties.

iii. Water quality

111. A major short-term impact of civil construction works on coastal water quality is caused from soil erosion and sedimentation. Local suspended sediment levels (TSS) will reach maximum possible concentrations which can last over long periods of time depending on the extent of pier and shoreline facilities development. However, the natural tide and currents at the

sites will dissipate suspended sediment. As indicated above excavation/disruption of the sea bottom and nearshore area also re-surfaces anoxic and any toxic material lying in the sediments.

112. The other common source of surface water pollution during construction phase is from oil, gas, and grease from the operation [and maintenance] of heavy equipment in, and near surface waters. Fuel tanks can leak, and spent oil and grease can also be discharged in or near the lakes or streams.

Mitigation

113. Silt curtains should be installed to isolate the pier and shoreline works. At a minimum silt curtains should be placed on downstream side of work area to contain suspended sediment. Regular water quality monitoring will be conducted during dredging and embankment rehabilitation works to ensure that temporary disruption of the water quality through sediment stir-up is contained within the direct area of work. Any dredging or excavation at the shoreline should be minimized. Fuel and vehicle/equipment lubricants must be handling at a dedicated, well signed, fenced site that has a concrete floor. Refueling of vehicles must occur at the site, refueling of boats must be carefully environmentally controlled at a marine location away from public areas. Spill response procedures and spill kits for organic pollutants such as gas/diesel fuels, and oils must be provided by contactors and PIU with required training provided.

iv. Noise

114. Operation of heavy excavation equipment, pile driving for footings, and movement of large construction vehicles creates noise. Tourists and residents within 60-90 m surrounding the pier and facilities construction sites could become annoyed by noise generated from construction activities. Pile driving could create noise exceeding the government or the WHO standard for noise at sensitive sites if applied.

Mitigation

115. The operation of heavy vehicles for the pier works and associated facilities on the should be scheduled during the hours of 07:00 and 18:00. All heavy equipment should be kept in good working order. Noise monitoring will be conducted regularly at sensitive sites to ensure that noise levels are contained within the WHO standard of 55-70 dB(A) during daytime. Temporary noise barriers shall be used in case noise levels exceed the standard value.

v. Dust and air pollution

116. The operation of heavy equipment will emit SOx, NOx, and CO_2. The local levels of these gases can be high depending on how well equipment is maintained in proper working condition, and if uncontrolled vehicle idling is allowed. In addition to air pollution, exhaust from heavy equipment can become a significant nuisance to residents.

117. The operation of heavy trucks along construction roads Victory beach will create dust. The dust levels can be significant depending on the amount of sand and small aggregate is transported along the roads, and how much mud and sand accumulates on the roads that is spread from the tires of the construction vehicles.

Mitigation

118. Wetting agents should be applied regularly to all construction roads. Trucks carrying

aggregate should always be covered. All construction vehicles should be kept in good working order.

vi. Solid and domestic waste

119. The pier and shoreline facilities construction will generate solid waste and domestic waste from workers, and from discarded construction materials in the form of discarded concrete, wood forming, reinforcing bar, and sheet piling. Work camps, whether temporary or long term, provide places to eat and sleep for workers. Camps provide pit latrines and supplies of potable water for cooking and bathing. Domestic liquid and solid waste can become a local problem depending on the size of the camp, and compliance with formal waste management procedures.

Mitigation

120. A formal waste collection and disposal program should be instated at all sites which must be approved by the provincial DOEs. All waste construction material must be stored and removed from site daily or weekly. Worker living areas must be provided with adequate garbage bins, and garbage collected and transported to local landfill regularly. Pit latrine areas must be kept clean, and buried when camp closed.

vii. Reduced road access, increased traffic, and risk of traffic accidents

121. Construction traffic on existing roadways to Victory beach could block normal local traffic thereby reducing access. This will be particularly relevant to the tourist/urban core areas of Preah Sihanouk City where traffic density is highest. The increased construction vehicle traffic that will occur with the pier works, and along routes to sediment disposal sites will affect normal traffic patterns and volumes. Along with the increase in large truck traffic will be an increase in the risk of traffic accidents.

Mitigation

122. A traffic management plan must be put in place for local and construction traffic near the pier development sites. Enforced speed limits must be well posted, and additional traffic direction signs to assist both construction and local traffic should be posted outside and inside construction zones and along construction truck routes. The traffic management plan shall be developed by the works contractors as part of their construction environmental management plan (CEMP), and be submitted to local (provincial and city) traffic control authorities for approval.

viii. Boat transportation & fishing/aquaculture

123. Pier construction and associated shoreline works could interfere with local boat traffic along the affected coastlines. Pier works will also potentially affect fishing activities.

Mitigation

124. Shoreline signage should be placed above and below pier and shoreline work areas, and community information leaflets should be distributed to warn and educate users of the water bodies of the subproject activities. The user community should be consulted so that the pier development activities can be scheduled to avoid user activities. The PIUs, with support from the EA, will be responsible to inform all users of the affected sections of Koh Touch and

Victory beaches of the types and schedules of activities that could disrupt uses of the surfaces waters.

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

125. There are no known rare or endangered terrestrial wildlife species or critical habitat in the immediate vicinity of the subprojects in Kep and Preah Sihanouk. The subprojects are not near Bokor or Ream National Parks. While the pier development on Koh Touch beach, Koh Rong island is adjacent to Koh Rong National Park, and inside the Koh Rong MPA, the pier construction works are being developed in the Multiple Use zone of the MPA within an existing urban area. The results of the IBAT screening of the sites (Appendix D) also show the absence of rare or endangered wildlife in the immediate subproject areas.

126. There are no physical cultural resources that are at risk of being damaged by the subprojects at the feasibility design stage. Thus, the construction phase activities that are implemented along with specified mitigation measures should not negatively affect sensitive ecosystem and cultural resources and values.

127. Because the final locations of facilities and components of the subprojects will only be confirmed at the detailed design phase, the potential exists for valued ecological and cultural resources to be negatively affected should subproject locations be altered significantly. Thus, as part of the detailed design stage when subproject siting and designs are finalized, and the IEE and EMPs are updated to meet the detailed designs, a review of any changes in proximity and sensitivity of eco-cultural resources should be undertaken. Moreover, final siting and designs need to be reviewed to ensure that the targeted original subproject selection criteria are met.

3. Operation Phase

a. Kep solid waste management

128. At the feasibility design the MOT and DPWT envisions that the upgraded landfill will either be managed by the DPWT, or the private sector. The arrangements and responsibilities for the operation of the landfill must be confirmed at detailed design followed by required training and capacity development (see below). Noteworthy is the proposed imposition of a public environmental tax or user fee for the upgraded landfill. The revenue generated will be used to support O&M which is critical for the sustainability of the upgraded landfill.

129. Posted speed limits along the upgraded access road to the upgraded landfill site must be enforced to prevent accidents, and sufficient annual O&M budgets should be provided to maintain all garbage trucks and landfill service vehicles in good working order to reduce the air pollution. Wetting agents should be regularly applied to access roads and both landfill areas to control dust, and wind-blown debris.

130. As part of O&M, groundwater quality at the monitoring bore holes that are installed during the groundwater study (Appendix B) must be monitored regularly to ensure groundwater does not become contaminated by the new landfill cells, leachate streams, or septage treatment of the landfill. The operators of the landfill will need to be trained by DOE or by the groundwater firm on how to sample, and process (preserve & transport) groundwater samples from the landfill for subsequent analysis in a DOE-approved laboratory in Phnom Penh. Conversely, the DOE or the groundwater firm will take responsibility to collect the groundwater samples. The arrangements,

responsibilities, and financial support for groundwater monitoring will be clarified at detailed design.

131. Capacity development proposed through the project (Output 3) includes training for operators of the upgraded landfill. The proposed technical training, as set out in the Project Administration Manual, will include general management of landfill, and sanitary landfill features and lifetime operation including: (i) landfill gate control and cell management; (ii) leachate collection and confinement; (iii) medical waste – handling & disposal; (iv) on-site sorting & recycling; (v) gas collection, gas safety & flaring. Similarly, the waste pickers and possibly additional persons will be trained to operate and manage the MRF facility at the upgraded landfill. Training on receiving, sorting and packaging, and storage of incoming solid waste to develop the capacity of operators of the MRF will occur.

132. Landfill and solid waste management, and employee working conditions must meet the requirements of RGC Decree Management of Urban Garbage and Solid Waste, No. 113, NKR-PR 2013, and the Government Occupational and Community Safety and Health (OHS) guidelines (OHS Programme for Cambodia, 2010-2013) that was developed by the International Labour Organization (ILO). As per SPS (2009) landfill operations working conditions must also meet the ICF EHS Guideline for Solid Waste Management Facilities. Opportunities for formalizing the roles of informal waste pickers and providing employment at the MRF should be explored.

133. The mitigation measures should support the comprehensive IFC EHS guidelines (2007) for solid waste management facilities. The guidelines address the full cycle of solid waste management starting with waste prevention and minimization, collection and transport, recycling and reuse, treatment, storage and disposal, and monitoring. The EMP will further elaborate the requirements of the IFC guidelines.

b. Preah Sihanouk seaside access improvements

134. A common cause of flooding along roadways throughout Asia is inadequate maintenance of drainage ditches and culverts that are designed with sufficient capacity. Provincial and municipal governments too often fail to support O&M needed to simply regularly clean and lightly maintain drainage networks. The project (Output 3) will provide supplemental training of DPWT where needed to maintain the upgraded roads and drains. The onus will be on DPWT to support and implement required O&M for the roads and drainage.

135. Posted speed limits along the upgraded access roads along Otres and Ocheuteal beaches must be enforced to prevent accidents, and damage to roadside property. Sufficient annual O&M budgets should be provided to manage the new toilet blocks, shower facilities, and the increased solid waste that will be produced at the beaches. Wetting agents such as water or $CaCl_2$ must be regularly applied to access roads to control dust, and wind-blown sand and debris.

c. Operation of Koh Touch and Victory beach piers

136. The expected increase in tourist boat traffic to/from the new piers on Koh Rong island and west Preah Sihanouk City could create land and water pollution from solid waste, domestic waste, discharged boat holding tank wastewater, and spills of gas and oil. Increased tourist visitation at both pier sites will generate garbage which must be managed with sufficient well-placed garbage cans that are emptied and garbage disposed regularly at DOE-approved landfill sites. Solid waste produced at the pier on Koh Rong island must be transported to Preah Sihanouk mainland.

Similarly, the septic tanks of the new public toilet facilities at the pier sites must be pumped regularly with septage disposed in DOE-approved landfills.

137. Water pollution from gas or oil spills, or from discharged boat holding tanks must be prevented with a published code of conduct for boat operators which ideally leads to the issuance of a specific regulation for environmental protection requirements of tourist boat operators. A loan assurance for the protection of KR MPA will be prepared which will act as the first step toward needed follow-up legislation. The loan assurance will specify prohibited activities such as discharging boat holding tanks, and throwing solid waste into the water, while specifying activity requirements and restrictions such as adhering to established navigation lanes that are not near sensitive features such as coral reefs, enforced speed limits, and boat refueling at designated safe places away from public areas. The loan assurance (code of practice) will also specify requirements for life jackets, and certain sea, wind and rainfall conditions during which tourist boats cannot be operated.

C. Induced Impacts

138. Potential induced impacts that will stem from the targeted increase in tourism from the new piers and upgraded beachfront roads is widespread pollution and environmental degradation in the greater Preah Sihanouk City and outer island areas which will occur from expanded development of hotels, restaurants and tourist recreational facilities. The desired increase in tourism in the coastal area will increase pressure on environmental quality degradation, and the destruction of remaining valuable coastal environments such as mangroves, and other coastal wildlife habitat. The key mitigation is effective application and enforcement of the existing RGC regulatory framework for environmental protection.

Climate Change

139. A Climate Risk and Vulnerability Assessment (CRVA) was prepared separately. Provided below are excerpts from the CRVA, climate change adaptation measures and initial estimates of the project's greenhouse gas emissions (GHG).

1. Projections

140. Reports and summaries of climate change scenarios for Cambodia, based on the most recent climate change projections of the different Global Circulation Models (GCM) and Regional Climate Models (RCM) indicate that by 2060 average annual air temperature in the country may increase between 0.5–2.7^{o}C, and total rainfall may change between -11% and +31% during the rainy season, and change between -11 and +35% during dry season.[15] By 2050 mean sea level is projected to increase by almost 1.0m. The recent assessment of regional climate change in Koh Kong province[16] for two Representative Concentration Pathway (RCP) scenarios shows GHG emissions of 4.5 and 8.5, with increases in air temperature against the baseline of 1980-1999 of 0.7–1.0 ^{o}C by 2025. However, contrasting projected changes to air temperature and the

[15] IPCC 2014. IPCC Fifth Assessment Report: Working Group 2 Impacts, Adaptation and Vulnerability Chapter 24 Asia Intergovernmental Panel on Climate Change; UNEP, 2010. Assessment of Capacity Gaps and Needs of Southeast Asian Countries Addressing Impacts, Vulnerabilities, and Adaption to Climate Variability and Climate Change; ADB TA - 7459 REG: Greater Mekong Subregion Biodiversity Conservation Corridors Project Pilot Program for Climate Resilience Component, Cambodia, Supplementary Appendix M.

[16] Thoeun Hang Sen, 2015. Observed and Projected Changes in Rainfall and Temperature in Cambodia. Water and Climate Extremes.

longer-term projections of rainfall from other studies above show annual precipitation decreases by -1 to -2.5% by 2025.

2. Greenhouse gas emissions

141. The project will generate greenhouse gas (GHG) emissions from vehicles on project roads and boats using the improved piers. The emissions of methane (CH_4) from the upgraded landfill should be zero to minimal because of the gas capture and control technology that will be installed. The project will generate greenhouse gas (GHG) from anticipated increased vehicle traffic on subproject access roads, however, the increase in vehicles is not expected to exceed the 100,000CO_2e/a.[17] GHG emissions from project roads was established based on the guidance provided in *ADB's Environment Safeguards - a Good Practice Sourcebook* (2012). If the traffic expressed as passenger car units per day (PCU/day) is below the numbers indicated in Table 25 (in a representative year) the emissions in that year are unlikely to exceed the 100,000 tons CO_2e threshold.

Table 17. Maximum Number of Passenger Car Units per Km to Trigger 100,000CO2e/a

Length of Road. (km)	PCU/day	Length of Road. (km)	PCU/day
10	76,000	50	23,000
20	57,000	60	19,000
30	38,000	70	16,000
35	33,000	90	13,000
40	28,000	100	11,000

Source: ADB Environment Safeguards - a Good Practice Sourcebook (2012)

142. The total length of the new roads is estimated at less than 10km. Only road upgrades will occur. Traffic flows in a representative year of 2030 are expected to be below the 76,000 PCU/day traffic to reach 100,000 tons/a of GHGs. The impact of increased boat traffic to/from the new piers on GHG emissions is also being assessed.

143. The project also supports adoption of ASEAN Tourism Standards (e.g., Homestay Standard, Clean Tourist City Standard, Green Hotel Standard, and Clean Public Toilet Standard). This will reduce the carbon footprint of the subproject areas through increased energy efficiency (e.g., use of LED lighting), and reduce GHG emissions. An estimate of the reduction in GHG emissions arising from replacing incandescent and fluorescent lighting with LED lighting in hotels in the subproject areas will be provided.

3. Climate Risk and Vulnerability

144. The indicative sensitivity of the 2 subprojects in Preah Sihanouk to climate change was classified mostly as "HIGH" by the AWARE™ software tool which is used to assess climate change sensitivity of proposed infrastructure projects. The software combines geographic information on current site-specific climate, climate hazards from topography, elevation, and distance to ocean, and the latest climate change projections for each area. The HIGH sensitivity of the two coastal subprojects is due primarily to proximity to vulnerability to sea level rise and storm surge.

[17] ADB (2016) Guidelines for Greenhouse Gas Emissions Transport Projects.

4. Climate Proofing Project Infrastructure

145. The subprojects are designed to be resilient to the impacts of present-day climate extremes defined primarily by rainfall intensity and wind on flooding, sea storm surge, and erosion. The sensitive components consist of for example; (1) pier and beachfront walkway foundations, (2) drainage capacity; and (3) road bed grade and pavement type. These design factors must be resilient to climate change for the individual components to be sustainable without premature, major retrofits. Provided below is an indicative estimate of the costed design criteria for climate proofing the subprojects.

a. Pier developments

146. The climate reliance measures for the two piers on Koh Touch beach and Victory beach are focused on the foundations and piling of both piers, and on the access road and drainage at the pier on Victory beach. For the pier on Koh Rong island an estimated additional $90,000 will be spent fortifying the pier foundation and piling with additional concrete. Whereas an estimated $129,500 will be spent fortifying the foundation and piers with additional concrete for the pier on Victory beach. The heights of the new piers will be set higher than nearby piers providing resilience to projected sea level rise, however, the most important climate change resilient measure is the strengthened pier/foundations against storms.

b. Upgraded beachfront access roads and walkways

147. Beachfront upgrades will be exposed periodically to wind and water events from storms. The heights of the existing beachfront roads and walkways, range from just above to –1.0m+ above monthly high tide level, and are set back from the water line by at least 20m. The climate change resilience measures focus on expanding the capacity of drainage of the beach road areas, and raising the beach road beds where necessary to avoid projected increases in sea level. An estimated additional $870,000 will be needed for the installation of box culverts, manholes and outfalls on both sides of the beach roads; and all new sections of beach roads will be surfaced in concrete. The materials and foundations of the beachfront structures will be resistant to erosion and exposure to storms. The preliminary design assumptions for climate change are an increase in maximum rainfall, and increase in mean sea level.

c. Kep Solid Waste Management Improvements

148. An additional estimated $499,000. will upgrade the existing main dirt access road to the upgraded landfill. The extra cost is primarily for concrete surfacing and elevating the roadway in low-lying areas. An additional $90,000 will fortify the road, and stormwater drainage in the landfill site.

VI. PUBLIC CONSULTATION

149. The stakeholder consultation strategy during project preparation adopted the principles of meaningful engagement, transparency, participation, and inclusiveness to ensure that 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 was conducted jointly with the parallel social impact assessment.

150. The approach to stakeholder consultation for environmental concerns or issues with the Kep and Preah Sihanouk subprojects consisted of the following three avenues of inquiry and data collection:

1) As part of the household and village leader interviews conducted jointly with the social development team;
2) Where possible separate consultations with provincial agencies and other stakeholders by social development team; and
3) Individual interviews conducted by the project Environment Specialists during project meetings with provincial and national environmental regulatory agencies.

A. Identification of Stakeholders

151. 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 invited including the (i) project EA and IAs (ii) provincial agencies (e.g., Provincial Department of Environment (DoE), Women's Affairs, Provincial Department of Commerce (DoC), Provincial Department of Tourism (DoT), Provincial Department of Water Resources and Meteorology (DOWRAM), Provincial Department of Public Works & Transportation (DPWT);
- Communities living near 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.

B. Discussion Guide

152. Five open-ended questions and information requests (Table 18) guided stakeholder discussions.

Table 18. 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 about subproject.

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 about the **completed operation phase** of the completed subproject?
   Please list environmental concerns about 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?

153. To help guide the discussions on environmental issues and concerns of subprojects a list of environmental components (Table 19) was introduced to the stakeholders ahead of the question and answer period. Stakeholders were encouraged to add their own components of environment to the discussions.

Table 19. 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

154. The list of participants and recorded minutes and photographs of the public consultation meetings held in Preah Sihanouk and Kep are in Appendix A. Below is a summary of discussions.

1. Kep Town

155. The consultative meetings for environment were conducted in town (Sangkat Kep) and Sangkat Prey Thu and Sangkat Ou Krasa. The meetings were conducted with Kep environment department on 4 September 2017 and with local authority and villagers on 5 September 2017. Different provincial departments (Environment, Tourism, Agriculture and Public Works & Transport) and households / villages affected by the subproject components were invited. Sixty-five (65) non-government participants consisted of individual villagers, and village representatives of the areas affected by the different subproject components.

156. The stakeholder consultations showed overall positive support for the subproject. Tables 20 & 21 summarize the comments and concerns raised. Table 22 provides input from the provincial DOEs. The follow-up stakeholder consultations required during the detailed design phase will begin with a review of the issues and mitigations initially identified by the stakeholders.

Table 20. Summary of Stakeholder Views in Kep town

Benefits of subprojects expressed by stakeholders	• Improved environment because of new landfill in Kep city/province • Improved living standard of people in Kep city due to improvement of new landfill • City will be cleaner due to new collection method and services • The provincial development plans will be supported by subprojects • Reduce the disease from infection from waste in the city • City is clean with good infrastructure	
		Safeguard Response
Construction phase issues	• Site selection for borrow pit • Noise from construction activities; • Air pollution from dust during construction; • Waste from the construction material • Soils remaining after construction in front of house along access road • Dust and noise from the construction activities • Disturbance to the people living next to project site during the construction • Traffic congestion may disturb tourists and people living in Kep city • Traffic accident during construction • Block access to homes of people living along the project construction sites • Wastewater from camp of workers • Construction workers may infect local people with HIV/AIDS • Drug traffic with workers • Affect people's income due to loss of structure without compensate; • Affected structures and trees along the road and proposed area of project	• For the construction phase the EMP specify mitigation sub-plans for constructions disturbances such as noise, dust, solid and liquid waste management, traffic congestion, public and worker safety, blocked access, and management of waste from worker camps. • The EMP also prescribe measures to prevent or reduce social issues arising between the community and worker force such as HIV/Aids • Tree loss mitigation, and site restoration plans are included in the EMP • All potential loss or damage to structures and cultural property will be avoided as per specifications of EMP. Contractors, however, will be required to completely restore disturbed sites, and to cover all costs of restoration of the sites, and any property damage.
Operational phase issues	• Project may affect people living along the road to landfill due to disturbance from waste collection trucks. • If landfill managed by company, they will not apply the technical management.	• Included with the improved landfill is a re-designed operations and schedule of garbage trucks traveling to/from the landfill to increase safety and reduce costs. This will include speed limits along access road and in and town. Moreover, new compactor trucks will be purchased to replace existing open garbage trucks which will prevent odor from affecting residents along the road.

		• The private company that may operate the improved landfill will have to abide by a contract with environmental management and safety provisions.
Suggested impact mitigation measures	• Traffic on the road should have traffic officer to manage traffic during construction. • Sub-constructor must spray water on roads during construction. • Cover soil trucks during transportation to avoid air pollution. • Machines in good working order should be used during construction to avoid air pollution. • Wastewater and solid waste management system must minimize environmental impacts; • Standard construction management on both safety and environment should be applied; • Compensate affected people if there are lost assets. • All affected persons must receive compensation; • Subcontractor must spray water on used road regularly to avoid dust; • Solid waste generated from project must be collected and disposed every day; • In the operation phase, landfill must be managed properly. During transport, waste must not be allowed to fall on to roads. • All waste collection trucks must be cleaned regularly.	• Throughout the construction phase and into the operational phase construction traffic will be managed to minimize congestions, and prevent accidents with the public. • As part of the mitigation sub-plan for dust, water or other wetting agents will be used on all construction roads to prevent dust • Similarly, contractors will have to keep all construction vehicles in good working order. • All construction wastewater will be isolated and disposed according to regulations (e.g., MOE, 2009). • Existing MoL and ILO regulations for worker and public safety will be applied to the subprojects during construction and operational phases. • The subproject incorporates a capacity development and training program for all agencies responsible for the operation and maintenance of the improved landfill. • Asset loss compensation is part of the pre-construction phase of the subprojects as indicated above. • The project will build capacity and train operators to support O&M and adherence to strict operating guidelines and rules for the upgraded landfill site including operation of the new compactor trucks to ensure overall sustainability of upgraded solid waste management in Kep. • Solid waste will be collected daily according to the needs of each area in the town.

Table 21. Results of public consultations for affected Sangkats - Kep

Meeting Location	Individual Concern or Issue	Response in EMP
Sangkat Kep	• Install dust bin in each of the central of Sangkat • Waste collecting is usually late (at least 2 or 3 days) • The new road for entrance landfill should be 6 m wide • People don't put the waste in waste container properly.	• The separate social impact assessment prescribes installation of waste containers in the Sangkat.

Sangkat Prey Thum	• The waste collecting trucks don't dump properly in landfill area. • Odor and flies are a problem • Spray water during dry period. • Confirm schedules with local people before construction. • All waste collection trucks must be cleaned regularly.	• The EMP specify mitigation sub-plans for constructions disturbances such as smell, air pollution, and proper management of waste collection equipment.
Sangkat Ou Krasar	• Landfill odor • Sound impact from waste collection truck • Leachate from landfill • Extension and awareness about how to separate the waste	• The EMP specifies mitigation sub-plans for operational phase disturbances such as odor, air pollution and proper maintenance of waste collection trucks, and equipment at the landfill site to minimize noise. Leachate will be collected and recirculated through the waste cells. Training of waste pickers/sorters to operate the MRF will occur.

Table 22. Results of public consultations with Kep provincial departments

Department	Individual Concern or Issue	Response in EMP
Environment	• Air quality, noise and vibration • Traffic congestion during construction period. • Quality of collecting trucks during operation • It may pollute to ground water. • It may affect to public health in both phase construction and operation.	• For the construction phase of subproject in Kep province the EMP specifies mitigation sub-plans for construction disturbances such as traffic congestion, air quality, noise, vibration traffic and public health. • The EMP also incorporates a capacity development and training program for all agencies responsible for the operation and maintenance of the new landfill in Kep city. • Strict operating guidelines and rules for the new and upgraded landfill site will be identified as part of capacity development of Output 3 described in PAM and enforced to ensure the sustainability of effective solid waste management, including operation of covered garbage trucks.
Agriculture	• Project location is not in protected or conservation area • Odor and flies • Protecting the proposed new landfill site by fencing it	• For the operation phase the O&M of the upgraded landfill will specify measures such as covering non-active waste cells to reduce issues or odor and flies. The closed new compactor trucks will also act to reduce odor and flies. • The EMP also prescribes fencing around the completed upgraded landfill to keep animals and people out.
Public Works & Transport	• Traffic problem during construction period. • The new road should be 6 m wide.	• Throughout the construction phase and into the operational phase construction traffic will be managed to minimize congestion, and prevent accidents with the public.

	• Installing drainage system in both side of the road.	• Road design is 6 m wide The design of the upgraded landfill access road includes improved lateral stormwater drainage.

2. Preah Sihanouk

157. The consultative meetings for environment were conducted in both mainland Preah Sihanouk and Koh Rong island. The meetings were conducted with relevant management departments from 14 to 15 June 2017, and with local authorities and villagers from 16 and 17 June 2017. The different provincial departments (Environment, Tourism, Agriculture, Public Works and Transport, and the Municipality of Preah Sihanouk City), households/ villages affected by the subproject components were invited. Sixty-one (61) non-government participants, including individual villagers and village representatives of the areas affected by the different subproject components joined.

158. The stakeholder consultations for both subprojects showed overall positive support. Tables 23 and 24 summarize the comments and concerns. Table 25 summarizes input from the relevant provincial management departments. 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 23. Summary of Stakeholder Views in Preah Sihanouk

Benefits of subprojects expressed by stakeholders	• Improved living standard of people in Preah Sihanouk due to improvement of existing road, and construction and operation of two new piers; • Preah Sihanouk will have better sites to attract tourists; • Preah Sihanouk will be cleaner due to the new infrastructure subprojects; • The provincial development plans of Preah Sihanouk will be supported by subprojects; • Increased GDP in Preah Sihanouk due to subprojects; • Beach has toilets and is cleaner • Tourist have easy access road along the beach	
		Safeguard Response
Construction phase issues	• Do resettlement plan before construction • Site selection for borrow pit(s) • Sea water quality impacts from construction activities • Noise from construction activities; • Air pollution from dust during construction • Solid waste from the construction material left behind • Disturbance to people living next to project site during the construction • Traffic congestion may disturb tourists and people living in Preah Sihanouk • Increased traffic accidents during construction • Block entrance roads to homes of people living along the project construction • Wastewater from worker camps	• For the construction phase of both subprojects in Preah Sihanouk the EMP specifies mitigation sub-plans for constructions disturbances such as noise, dust, solid and liquid waste management, traffic congestion, public and worker safety, blocked access, and management of waste from worker camps. • The EMP also prescribes measures to prevent or reduce social issues arising between the community and workers such as HIV/AIDS • The separate social impact and land acquisition assessments prescribes compensation measure for lost income or property due to subprojects • Tree loss mitigation, and site restoration plans are included in the EMPs for both subprojects in Preah Sihanouk.

	• Construction workers may infect local people with HIV/AIDS • Drug trafficking with workers • Reduced income of people with shops along the beach and beach roads during road upgrades • Lack of compensation for loss of structures and assets • Impact on structures and trees along the road and proposed areas of subproject	• All potential loss or damage to structures and cultural property will be avoided as per specifications of EMP.
Operational phase issues	• Pollution of seawater due to fuel linkage from increased tourist boats/express boats • Improved drainage may not be managed properly. • Seawater pollution due to improper management system of solid waste in on mainland and on island	• Incorporated into the operational phase of the new pier and toilet blocks on Koh Rong Island as described in the EMP are regular septic tank pumping and monitoring of shoreline water quality to ensure new toilets do not cause local pollution. • The O&M for both piers will include development of a boat management & navigation plan, as well an environmental code of conduct at the piers and along navigation routes to the piers. • O&M for solid waste management at both mainland and island pier areas will be included in project
Suggested impact mitigation measures incorporated in EMP	• Construction of new sections roads and associated drainage will be finished before starting to another place • Traffic on the road should have facilitator to resolve during construction. • Sub-constructor must spray water on road during construction. • Cover on soil trucks during transportation to avoid air pollution. • Machines in good working order should be used during construction to avoid air pollution. • Wastewater and solid waste management system must minimize environmental impacts • Standard construction management for safety and environment should be applied • Training for operation and management of waste water treatment plant should be applied • Compensate affected people if there are lost assets. • All affected people must receive compensation • Subcontractor must spray water on road regularly to avoid dust • Solid waste generated from project must be collected and disposed every day	• A sectional approach to start and finish upgrades to seaside access roads will be employed as part of minimizing disturbance to tourist activity. • Throughout the construction phase and into the operational phase construction traffic will be managed to minimize congestion, and prevent accidents with the public. • As part of the mitigation sub-plans for dust, water or other wetting agents will be used on all construction roads to prevent dust • Similarly, contractors will have to keep all construction vehicles in good working order. • All construction wastewater will be isolated and disposed according to DOE regulations. • Existing MoL and ILO regulations for worker and public safety will be applied to the subprojects during construction and operational phases. • The subprojects incorporate a capacity development and training program for all agencies responsible for the operation and maintenance of the new infrastructure in Preah Sihanouk. • Asset loss compensation is part of the pre-construction phase of the subprojects as indicated above.

		• As part of capacity development and training, the roles and responsibilities of the operators of the new roads and piers, and appropriate penalties for public violators will be clarified to ensure the sustainability of the new systems. • Solid waste will be collected daily according to the needs of each sector in the towns.

Table 24. Results of public consultations for Koh Rong island

Meeting Location	Individual Concern or Issue	Response in EMP
Village 3, Sangkat 3	• Proposed subproject should include drainage and sewer system. • Contractor should provide job opportunity to local worker especially village 3.	• Pier structure and land-based service are will have adequate drainage and public toilets, and septage from septic tanks will be pumped regularly, and transported to mainland for disposal in DOE-approved sites • The EMP indicates that where possible local workers should be used for pier construction to support local economy.
Village 4, Sangkat 4	• Low affect to local people. • Traffic problem during construction. • Keep space for access to houses. • Confirm schedule with local people before construction.	• The EMPs specify mitigation sub-plans for construction disturbances such as blocked access and compensation plan. • There will be no vehicle traffic issues on island. EMP specifies measures to prevent or reduce disruption to pedestrian traffic on island during construction of the pier. Currently, there are no motorcycles on island

Village 6, Sangkat 4	• Loss of business during / after construction. • Construction should start from May to November (low season).	• For the construction phase the EMP specify mitigation sub-plans for constructions disturbances to act to prevent disruption of island business, and Khmer holidays including April New Years celebrations. • Construction scheduling will occur during low tourist season. • The project includes business support services
Village Koh Touch, Sangkat Koh Rong	• Impact houses next to the pier. • Guest houses should pay for wastewater treatment • Lose sea view • The pier should be public • Pier should have reception and waiting area for tourist and locals	• The EMP specifies mitigation sub-plans for constructions disturbances such as odors and preserves view • The prescription of plan/process to pay for environmental services associated with new pier is addressed separately by O&M plan which includes solid waste & septage management. • Public pier facility includes waiting area for tourists

Table 25. Results of consultations with Preah Sihanouk provincial departments

Department	Individual Concern or Issue	Response in EMP
Environment	• Affect people living in the right of way • Land for construction of new road • Marine ecological in both, mainland and island, on construction the new two piers. • Air quality, noise, vibration and water quality affected by the subproject • Lost the beach view • Only private benefit from construction the two new piers. • Difficulty to manage the two piers • Resettlement problem • Traffic congestion during construction	• For the construction phase of subprojects in Preah Sihanouk the EMPs specify mitigation sub-plans for constructions disturbances such as traffic congestion, water quality, air quality, noise, vibration • The resettlement plan provided fair compensation for lost land • The EMPs also prescribe measures to prevent or reduce marine ecology impacts at new piers and road construction. The project includes specific assurances to protect the KR MPA (see Appendix E).
Agriculture	• Changing the proposed place for construction new pier (in front of Provincial hall) to Tomnub Rolok and/or Ochheteal beach. • It may pollute to sea water quality and air quality • It may pollute to the beach • The piers should all be in one place to avoid pollution.	• For the construction phase of subprojects in Preah Sihanouk the EMP specify mitigation sub-plans for constructions disturbances such as traffic congestion and water quality. • The EMP prescribe measures to protect marine aquatic habitat and biota during construction phase of pier and seaside road access upgrades

	• Affect to tourist area – reduce small beach	• The EMP minimizes negative impact on tourist activity during construction and operation.
Public Works & Transport	• It may affect to land ownership and people in new pier and road • Traffic problem during construction period. • The pier in mainland should be in standard and supports to tourist boats • The new pier should consider length, wide, wave protection, water depth and access to the pier. • The new construction road should be 11 m to 16 m wide with 3 m both side for walk way. • Installing drainage system in both side of the road. • Proposed new detour road in front of the small mountain to avoid impact to private land. • The detour to Ou Tres should be upgrade to DBST. • The new pier should limit the parking space for tourist boats/speed boats and/or public boats.	• Land ownership issues with subprojects in Preah Sihanouk are addressed by RP. • The EMP prescribes traffic mitigation during construction and operation phases of access road upgrades. • The design of both piers will accommodate local ferries/tourist boats, not international cruise ships. • The design of both piers will be resilient to present and future climate-change induced changes to storm severity including storm surge. • The upgraded access roads will include lateral drainage. • The width of the upgraded roads has been determine based on traffic need, land availability and national road design standards. • The route around headland at east end of Ocheuteal beach will be an appropriate width. • Extended boat mooring at the pier will be prohibited to maintain clear access to the pier.

VII. ANALYSIS OF ALTERNATIVES

159. Initial alternatives to the Victory pier subproject was an upgrade or replacement of the existing tourist pier at west end of Ocheutal beach, and construction of a new pier as part of the larger passenger pier and future new hotel complex west of Victory beach site. Both alternatives were abandoned due to cost, land ownership uncertainties, and the dependence on a private investor in the case of the passenger pier/hotel development.

160. Alternatives subproject designs also considered use of bitumen road surfaces and different landfill liner types. Engineering solutions selected are appropriate options in terms of cost, durability, climate resilience, environmental and social impacts, and O&M capacities of project owners. Preliminary designs are compatible with Cambodia's construction standards and local contracting industry capabilities. Climate adaptation measures include stronger road-base and pavement structures and higher-capacity transverse and longitudinal drainage. The passenger piers incorporate sturdy elevated concrete and steel structures.

VIII. INFORMATION DISCLOSURE AND GRIEVANCE REDRESS MECHANISM

161. The subproject components were introduced to the public and key stakeholders during consultation meetings, which included verbal and visual presentations of all subproject components.

162. The IEE must be easily available to the stakeholders contacted during project preparation, in written and verbal forms, and in local language. At minimum, the Executive Summary of the IEE should be translated to Khmer and distributed to all persons affected by the project. The IEE should be available on the MOE/DOE and MOT/DOT websites, at their respective 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/PIU should be available at the same offices and websites. The IEE will also be available on the ADB web site. After implementation of the subprojects begins semi-annual safeguards monitoring reports will be prepared by the PCU and PIUs, and posted on the project and ADB website.

163. A well-defined grievance redress and resolution mechanism will be established to address 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, the detailed procedures for filing grievances, and appeal process. These will be publicized 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.

164. Affected persons (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 grievance committee will be responsible to make a written record during the first meeting with the APs.

165. A Grievance Committee that has experience with environmental and social issues will be organized in 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 MOT/DOT, PCU, PIU and ADB upon request.

166. 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.

i) 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 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.

ii) 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.

iii) 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.

iv) 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 the decision of the provincial court is still unsatisfactory to the APs, the APs may bring the complaints to the Higher Court.

167. The PCU will be responsible for checking the procedures and resolutions of grievances and complaints. The PCU safeguards focal staff must have expertise and experience in social and environmental issues associated with infrastructure developments. The PCU may recommend further measures to redress unresolved grievances. The consultant environmental specialists will provide the necessary training to improve grievance procedures for the grievance committee members when required.

168. 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 reimbursed by the project if the APs win their case.

169. 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 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.

170. If efforts to resolve disputes using the grievance procedures remain unresolved or are unsatisfactory, APs have the right to directly submit their concerns or problems to 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 ADB's Office of the Special Project Facilitator.

APPENDIX A: PUBLIC CONSULTATIONS IN PREAH SIHANOUK AND KEP

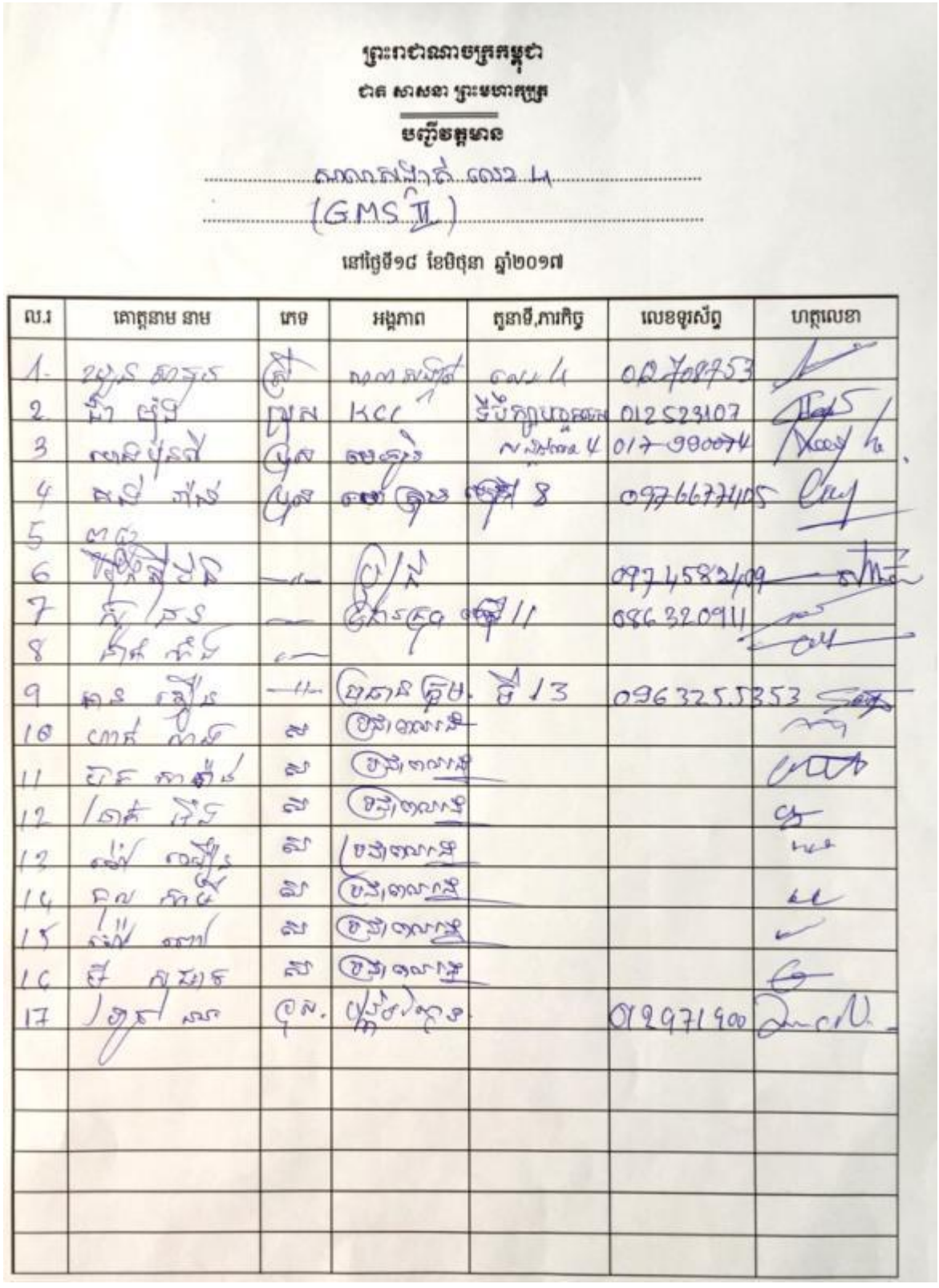
Preah Sihanouk








List of Participants, Preah Sihanouk Public Consultations



ព្រះរាជាណាចក្រកម្ពុជា

ជាតិ សាសនា ព្រះមហាក្សត្រ

បញ្ជីវត្តមាន

សាលាខេត្តព្រះសីហនុ

(GMS III)

នៅថ្ងៃទី១៨ ខែមិថុនា ឆ្នាំ២០១៧

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ជាតិ សាសនា ព្រះមហាក្សត្រ

បញ្ជីវត្តមាន

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[illegible] (GMS II)

នៅថ្ងៃទី១៨ ខែមិថុនា ឆ្នាំ២០១៧

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2	[illegible]	[illegible]	—	[illegible]	016658645	
3	[illegible]	[illegible]	—	[illegible]	016760031	
4	[illegible]	[illegible]	—	—	015709890	
5	[illegible]	[illegible]	—	—	[illegible]	
6	[illegible]	[illegible]	—	—	015598009	
7	[illegible]	[illegible]	—	—	087378891	
8	[illegible]	[illegible]	—	—	070400032	
9	potato	[illegible]			081466619	
10	[illegible]	[illegible]	[illegible]	[illegible]	092980476	
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PPTA 9090-REG: Preparing the Second Greater Mekong Sub region Tourism Infrastructure for Inclusive Growth Project

List of Participants in Meeting

Time and Date: 17 / 06 / 2017

Place: ភូមិ 3

Component:

N°	Name	Position and Agency	Signature
1	ផាន់ ឌីប	មេភូមិ 3	[signature]
2	ចែវ សាវ៉េត	ប្រជាជន	[signature]
3	នាយ កុសល	—	[signature]
4	ទៀង ចូវង	—	[signature]
5	អូ ម៉ាន់	—	[signature]
6	សុខ ពៅរិទ្ធី	—	[signature]
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PPTA 9090-REG: Preparing the Second Greater Mekong Sub region Tourism Infrastructure for Inclusive Growth Project

List of Participants in Meeting

Time and Date: 17/06/2017

Place: ក្រុម 3

Component:

N°	Name	Position and Agency	Signature
17	[illegible]	[illegible]	
18	[illegible]	[illegible]	
19	[illegible]	[illegible]	
20	[illegible]	[illegible]	
21	[illegible]	[illegible]	
22	[illegible]	KCC	
23	[illegible]	[illegible]	

PPTA 9090-REG: Preparing the Second Greater Mekong Sub region Tourism Infrastructure for Inclusive Growth Project

List of Participants in Meeting

Time and Date: 17 / 06 / 2017

Place: [illegible]

Component:

Nº	Name	Position and Agency	Signature
1	[illegible]	[illegible]	[signature]
2	[illegible]	[illegible]	[signature]
3	[illegible]	—	[signature]
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11	[illegible]		[signature]
12	[illegible]	KCC	[signature]

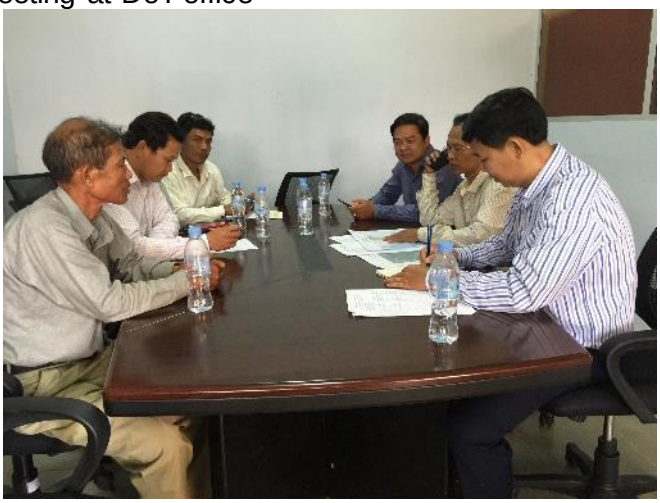
Kep

Meeting at Sangkat Kep

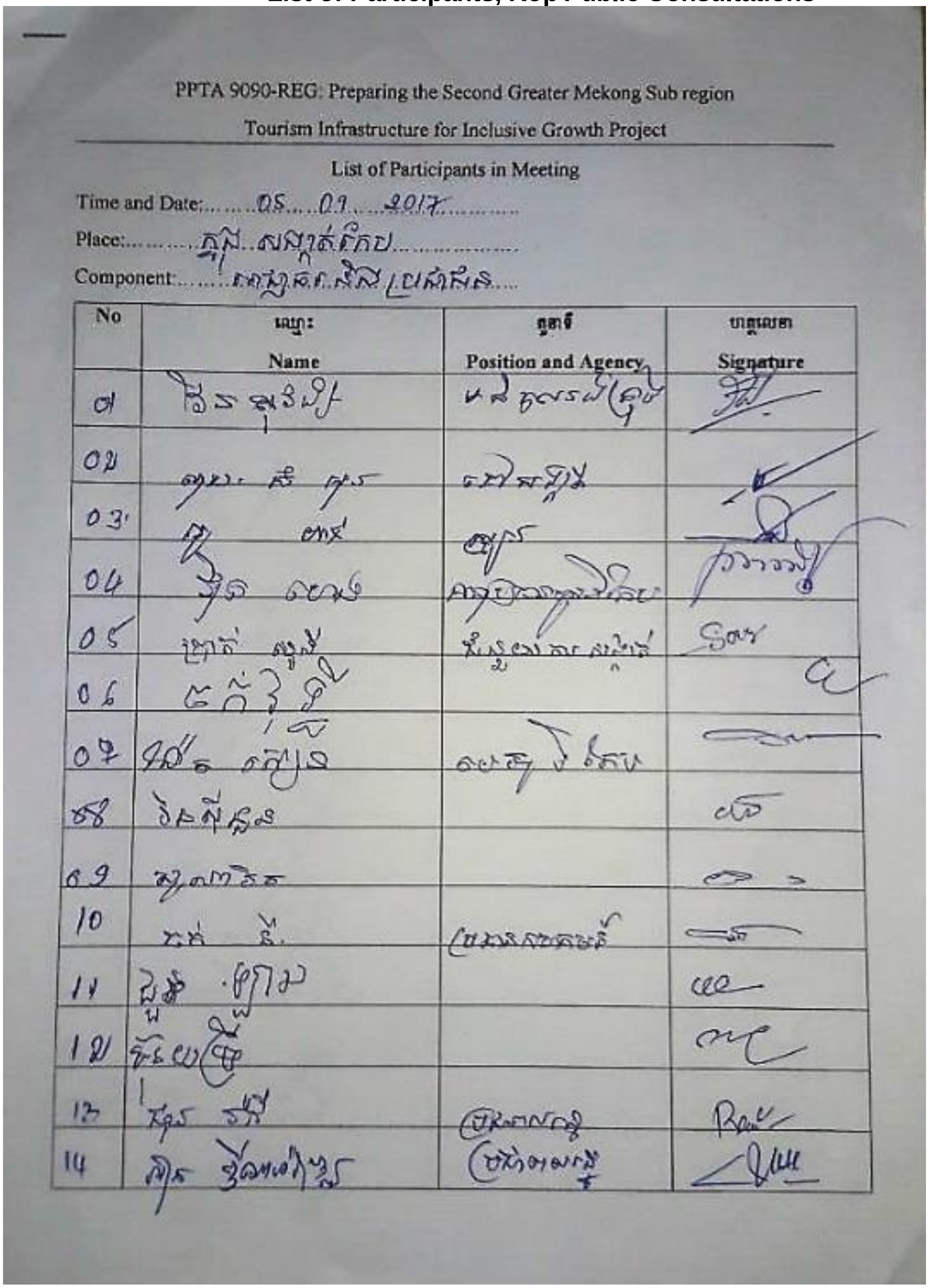

Meeting at Sangkat Prey Tum


Meeting at Sangkat Ou Krasar


Meeting at DoT office



List of Participants, Kep Public Consultations



PPTA 9090-REG: Preparing the Second Greater Mekong Sub region

Tourism Infrastructure for Inclusive Growth Project

List of Participants in Meeting

Time and Date: 05 . 01 . 2017

Place: [illegible]

Component: [illegible]

No	ឈ្មោះ Name	តួនាទី Position and Agency	ហត្ថលេខា Signature
01	[illegible]	[illegible]	[illegible]
02	[illegible]	[illegible]	[illegible]
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14	[illegible]	[illegible]	[illegible]

PPTA 9090-REG: Preparing the Second Greater Mekong Sub region

Tourism Infrastructure for Inclusive Growth Project

List of Participants in Meeting

Time and Date:......05...09...2017...............

Place:.........[illegible]......................

Component:......[illegible]......

No	ឈ្មោះ Name	តួនាទី Position and Agency	ហត្ថលេខា Signature
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PPTA 9090-REG: Preparing the Second Greater Mekong Sub region

Tourism Infrastructure for Inclusive Growth Project

List of Participants in Meeting

Time and Date: 05. 09. 2017

Place: ភូ. សង្កាត់ ស្រែក្រសាំង

Component: [illegible]

No	ឈ្មោះ Name	តួនាទី Position and Agency	ហត្ថលេខា Signature
1	ព្រុំ ភក្តី	សមាជិកក្រុមដឹកនាំចំបក់	[signature]
2	សេង ចេង	ប្រធានក្រុមស្ត្រី	[signature]
3	ចឹន វ៉ាន់	ក្រុមដឹកនាំចំបក់	[signature]
4	បុត គឹមចេង	ក្រុមស្ត្រី	[signature]
5	ហ៊ុយ ស៊ាង	— " —	[signature]
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11	រស់ សាលន	— " —	[signature]
12	លី ឌុង	— " —	[signature]
13	ប៉ុយ ង៉ុញ	— " —	[signature]
14	ឆឹម យ៉ាន់	ក្រុមដឹកនាំចំបក់	[signature]

PPTA 9090-REG: Preparing the Second Greater Mekong Sub region

Tourism Infrastructure for Inclusive Growth Project

List of Participants in Meeting

Time and Date:.........05.....09.....2017...........

Place:............[illegible].........

Component:..........[illegible]

No	ឈ្មោះ Name	តួនាទី Position and Agency	ហត្ថលេខា Signature
15	[illegible]	មេភូមិ	[signature]
16	[illegible]	សមាជិកក្រុមប្រឹក្សាឃុំ	[signature]
17	[illegible]	—//—	[signature]

PPTA 9090-REG: Preparing the Second Greater Mekong Sub region

Tourism Infrastructure for Inclusive Growth Project

List of Participants in Meeting

Time and Date:..........05.....09....2017.......

Place:..........[illegible]..........

Component:..........[illegible]

No	ឈ្មោះ Name	តួនាទី Position and Agency	ហត្ថលេខា Signature
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14	[illegible]	[illegible]	[signature]

APPENDIX B: DRAFT TOR FOR GROUNDWATER STUDY AT LANDFILL SITE

Groundwater Sampling and Analysis in Kep, Cambodia

Draft Terms of Reference
January 2018

1. Introduction & Rationale

The Asian Development Bank (ADB) is supporting small tourism infrastructure developments at select locations in Cambodia with the objective to improve and develop local and regional tourism. Kep Town in Kep province is one of the target locations. The ADB will fund improvements to solid waste management in Kep town. The project includes upgrading the existing active dumpsite located 13km northeast of the town into a more modern and effective landfill site. The upgrading of the dump site requires knowledge of groundwater in the area, specifically the depth of the water table, groundwater quality, and whether the existing dumpsite is contaminating the groundwater.

The project in Kep requests a quote to complete the following terms of reference. The quote should include costs for all field and laboratory analyses, and costs for travel to/from Phnom Penh.

1.1 Objectives

The objective of the assignment is to determine the depth and quality of groundwater near the existing dumpsite, and to understand of the effects, if any, of existing dumpsite on groundwater quality, including groundwater quality from any nearby wells. Direction of groundwater flow is to be estimated within the scope of the study.

The scope of the assignment includes:

1) sampling and laboratory analyses of groundwater quality at wells near the existing dumpsite if wells exist; and

2) bore hole drilling at dumpsite site to supplement existing nearby wells.

1.2 Coordination with Detailed Design Phase of Project

The assignment will be conducted at the beginning of the detailed design phase of the project. The Project Management and Civil Engineering Support Consultant (PMCES) with support from the PCU and PIU, in consultation with the DOE will tender and oversee completion of the assignment. The locations of all groundwater sampling locations will be determined at detailed design when this ToR is finalized.

2. Detailed Requirements

The requirements of the assignment are as follows:

2.1 Existing dumpsite

1) Confirm the location of any active wells that are near the site. A house is approximately 800 m southwest of existing dumpsite. Sample groundwater at existing wells;

2) Identify the number of supplementary bore holes that need to be drilled to provide a total of 4 equidistant sampling sites on an approximate 500-800 m radius of dumpsite site. Two of the sampling sites must be down-slope of the site;

3) Collect and preserve the groundwater samples from the 4 sites using accepted International procedures (e.g., AWWA)[18] to maintain the in-situ quality of the samples while they are transported to laboratory in Phnom Penh.

4) Analyze samples in laboratory using accepted International procedures (e.g., AWWA).

2.3 Groundwater variables to be sampled and analyzed at each site

The groundwater parameters should be sampled and analyzed at all sites are listed in the Table below.

Groundwater Variable	Location of Analysis
depth of water table	at well site
temperature (C^o)	at well site with meter
dissolved oxygen DO (mg/l)	at well site with meter
pH	at well site with meter
conductivity	at well site with meter
chemical oxygen demand COD (mg/l)	in laboratory
total dissolved solids DS (mg/l)	in laboratory
heavy metals: As, Cd, Fe, Pb, Zn, Cu (mg/l))	in laboratory
oil and grease (mg/l)	in laboratory
total and faecal coliform bacteria (mpn)	in laboratory
nitrogen: TN, NH_3, NO_3, NO_2 (mg/l)	in laboratory
phosphorus: TP, PO_4 (mg/l)	in laboratory
hydrogen sulphide H_2S, (mg/l)	in laboratory
surfactants (detergents) (mg/l)	in laboratory
Quality Control & Assurance Samples	
2 field sampling blanks with distilled water: 1 for existing landfill and 1 for new SLF 2 laboratory analysis blanks: 1 for samples from existing landfill, and 1 for new SLF samples	

3. Reporting

A report on the above field and laboratory investigations must be prepared.

[18] American Water Works Association AWWA, 2013). Standard Methods for Examination of Water and Wastewater: Water Wells.

3.1 Location of sampling sites

The report must provide a simple map indicating the location of the groundwater sampling sites in relation to the existing dumpsite. Each sampling site must include a latitude and longitude coordinate. The map should also indicate the location of the nearest houses or settlements. The map must distinguish the bore hole sites from existing well sites.

3.2 Groundwater quality

In a table format the report must provide the groundwater quality variables from Table 1 that were determine in the field, and in the laboratory for both sites. The tables should also include the QA/QC samples for all variables from Table 1.

3.3 Sampling & Analysis Methodology

The report must include a brief description of all field and laboratory methods that were used to sample and analyze the groundwater samples.

APPENDIX C : ENVIRONMENTAL COMPLIANCE AUDIT, KEP DUMPSITE

Solid Waste Dumpsite in Kep Town, Kep Province

Environment Compliance Audit

Terms of Reference

1.0 Background:

The Second Greater Mekong Subregion Tourism Infrastructure for Inclusive Growth Project will upgrade solid waste management of Kep town and vicinity as part of the Kep Solid Waste Management Improvements subproject. Central to the subproject is upgrading the existing garbage dumpsite in Kep town, Kep Province to a modern managed landfill. The purpose of upgrading the dumpsite and overall solid waste management of Kep is to improve the ability of the municipality to handle and process the steadily increasing solid waste that is being produced by tourism and general population growth of the area.

Solid waste management and the dumpsite in Kep is operated by the Department of Public Works and Transport (DPWT). The Ministry of Environment (MOE) is the regulatory body for environmental protection

The feasibility design of the upgraded managed landfill incorporates lined impermeable garbage cells, peripheral surface runoff collection and drainage, leachate collection and treatment, and gas recovery and flaring. The feasibility design also includes a materials recycling facility (MRF), a treatment facility for septage collected from septic tanks in Kep and area, special cells for hospital waste and other hazardous waste, and new garbage compacting trucks.

2.0 Purpose and Requirement of Environmental Compliance Audit

The Environmental Compliance Audit (ECA) of the existing dumpsite will provide additional critical site and operation information on the dumpsite which is needed for the future detailed and final design of the upgraded managed landfill. The results of the ECA will be combined with the groundwater quality and soils study of the dumpsite that has been drafted for the detailed design phase which is appended to the IEE for the subproject.

The Kep dumpsite is an *Existing Facility* of the Kep Solid Waste Management Improvements subproject which necessitates an ECA be conducted of that facility pursuant to the SPS (2009), para 10 of Appendix 1 and para 12 of Appendix 4. Specifically, para 12 of Appendix 4 of SPS (2009) states:

……for projects involving facilities and/or business activities that already exist or are under construction, the borrower/client will undertake an environment and/or social compliance audit, including on-site assessment, to identify past or present concerns related to impacts on the environment, involuntary resettlement, and Indigenous Peoples. The objective of the compliance audit is to determine whether actions were in accordance with ADB's safeguard principles and requirements for borrowers/clients and to identify and plan appropriate measures to address outstanding compliance issues. Where noncompliance is identified, a corrective action plan agreed on by ADB and the borrower/client will be prepared. The plan will define necessary remedial actions, the budget for such actions, and the time frame for resolution of

noncompliance. The audit report (including corrective action plan, if any) will be made available to the public in accordance with the information disclosure requirements of the SPS (2009).

More accurately for the context of the Kep subproject is that to protect the integrity and sustainability of the subproject, an ECA of the existing dumpsite is needed to identify present or past concerns or issues related to impacts of the dumpsite on the environment that could negatively affect the subproject. The ECA will accomplish the following objectives: 1) determine whether the dumpsite complies with current government laws and regulations; and 2) identify important information on the design/operation of the existing dumpsite and affected environment that will assist with the successful detailed and final design of the upgraded managed landfill. Objective 2 will be assisted with the application of IFC EHS Guidelines for Solid Waste Management Facilities[19] to the existing dumpsite to identify shortcomings of existing dumpsite, and moreover, the requirements of the detailed design of the upgraded landfill. The "*corrective action plan*" for any "*noncompliance issues"* identified above will become part of the detailed design of the new managed landfill along with improved solid waste manage of Kep.

Because the subproject involves upgrading an existing dumpsite [the existing facility], the SPS (2009) calls for the preparation of an environmental assessment and a compliance audit of the existing dumpsite. However, in this case the ECA along with the IEE of the subproject will suffice as the environmental assessment.

3.0 Scope of the ECA for the Kep dumpsite

Pursuant to the ADB SPS (2009) the consultant will conduct an ECA of the existing Kep dumpsite. To complete the ECA the Consultant will obtain and report on the detailed information and data for the existing Kep dumpsite listed in Table 1.

Table 26. Information requirements of ECA of Kep dumpsite

Description of Dumpsite:

1. Location of dumpsite (latitude and longitude coordinates);
2. Size of dumpsite (ha);
3. Date dumpsite was commissioned (became operational);
4. Current operator and responsible authority of dumpsite;
5. Types of solid waste disposed in dumpsite (e.g., domestic, hospital, construction, industrial);
6. Rate of solid waste disposal at dumpsite (ton/day or ton/month);
7. Clarify the design and operation of the existing dumpsite by obtaining following information:
    a) the number and depth (m) of waste cells;

[19] IFC/World Bank 2007. Environmental Health and Safety Guidelines: Waste Management Facilities; Municipal Solid Waste.

b) underlying waste cell lining material, if it exists;
c) description of surface runoff collection and drainage system, if it exists;
d) description of leachate and gas collection and treatment, if it exists;
e) description of septage disposal and management system;
f) description of waste recycling process by local waste pickers;
g) description of vehicles and equipment used to collect and transport solid waste from Kep and vicinity to dumpsite; and
h) current weekly schedule for transport of solid waste to dumpsite

Compliance with Government Regulations:

8. Determine if government issued permits or licenses for dumpsite operation exist. If yes, identify the permit or license, and determine whether dumpsite operation is in compliance with permit or license;

9. For government regulations and policy listed below clarify whether the design and operation of existing Kep dumpsite is in compliance, and clarify any non-compliance issues.

- Guidelines on Landfill Site Selection (MOE, 2016);
- Management of Urban Garbage and Solid Waste, RGC Decree No. 113, NKR-PR 2013;
- Directive on Industrial Sludge Management (MOE, 2000);
- Directive on Managing Health Wastes in the Kingdom of Cambodia (MOH, 2008)

10. For regulations and policy in #9 above define remedial corrective measures that are required for dumpsite to be compliant especially for non-compliance issues with community, and occupational health and safety regulations.

Additional IFC Waste Management Facility Guidelines: Municipal Solid Waste

11. Obtain existing data on groundwater (well) quality near the dumpsite from D/MOE or DPWT;

12. Describe air pollution mitigation measures at dumpsite (e.g., road wetting agents to control dust, controlling # of trucks entering dumpsite, covering garbage);

13. Determine distance of nearest surface waters (stream, lake) that could be affected by the dumpsite, and obtain existing surface water quality data

14. Determine distance of nearest homestead or business from dumpsite;

15. Determine number of full-time and part-time waste pickers that work and live at dumpsite

Community response

16. Consult surrounding community and waste pickers to determine if there are present environmental, social, or human health issues with the operation of the

existing dumpsite.

4. Site Visit

A site visit to existing dumpsite is required. The staff at the DPWT in Kep must be interviewed to obtain the required information listed above.

5. Report on ECA

Prepare a report on the ECA which details the 15 information and data requirements listed in section 3.0 above. The report should have the following general sections:

(i) Executive Summary.

(ii) Brief description of Kep dumpsite with 1-2 photographs.

(iii) A table or set of tables which clearly provide the detailed information and data requirements identified in Table 1. All available groundwater or surface water quality data should be tabled separately.

(iv) List of people and institutions contacted for information and data.

(v) Recommendations for upgraded managed landfill for Kep.

APPENDIX D: OUTPUT OF IBAT SOFTWARE FOR SUBPROJECT SITES

Proximity report generated by the Integrated Biodiversity Assessment Tool

Site name	Kep Landfill
Latitude/Longitude	10° 33' 51" North, 104° 19' 59" East
Date generated	15th January 2018
Generated by	asiandb
Company	ADB

Protected Areas and Key Biodiversity Areas

The following sites are found within the selected buffer distances:

Features within 2 km

National-level protected areas		
IUCN Category I-II	Kep	67 ha

Features within 5 km

There are no additional features within 5 km.

Features within 20 km

Protected areas designated under regional or international conventions and agreements		
UNESCO Man and Biosphere	Kien Giang	11,686 ha
Priority Sites for Biodiversity		
Key Biodiversity Area	Kampong Trach VU, migratory birds/congregations	1,108 ha

Proximity report generated by the Integrated Biodiversity Assessment Tool

Site name	Preah Sihanouk City - New Pier Victory
Beach Latitude/Longitude East	10° 38' 6" North, 103° 29' 58"
Date generated	15th January 2018
Generated by	asiandb

Protected Areas and Key Biodiversity Areas

The following sites are found within the selected buffer distances:

Features within 2 km

There are no features within 2 km.

Features within 5 km

National-level protected areas		
IUCN Category not reported/assigned	Kbal Chay	64 ha

Features within 20 km

National-level protected areas		
IUCN Category I-II	Ream	148 ha
Priority Sites for Biodiversity		
Key Biodiversity Area	Koh Rong Archipelago migratory birds/congregations	10,561 ha
Key Biodiversity Area	Prek Taek Sap CR/EN, VU	3,579 ha

Proximity report generated by the Integrated Biodiversity Assessment Tool

Site name	CAM Koh Rong Passenger Pier
Latitude/Longitude	10° 39' 54" North, 103° 16' 24" East
Date generated	15th January 2018
Generated by	asiandb
Company	ADB

Protected Areas and Key Biodiversity Areas

The following sites are found within the selected buffer distances:

Features within 2 km

Priority Sites for Biodiversity		
Key Biodiversity Area	Koh Rong Archipelago migratory birds/congregations	10,561 ha

Features within 5 km

There are no additional features within 5 km.

Features within 20 km

There are no additional features within 20 km.

APPENDIX E : ENVIRONMENTAL ASSURANCES

Environment

1) The government shall ensure Koh Rong Marine Protected Area (MPA) is not adversely impacted by the operation of tourist piers on Koh Touch Beach, Koh Rong Island and Victory Beach in Preah Sihanouk City. The Fisheries Administration of DAFF and the DPWT shall define and publish an enforceable code of conduct (CoC) for environmental protection for all boat operators that use the new piers. The CoC must include the following requirements. Additional requirements of the FA/DAFF and DPWT may be added as necessary.

(i) all boat operators must learn, have on board, and must follow the current activity guidelines set out by the FA for the different ecological zones KR MPA;

(ii) all boat operators must have on board, and must abide current government regulations governing boat operations in coastal waters (e.g., Management of Means of Water Transport 00067, RGC, MPWT Circular #003 (2011);

(ii) boats must not discharge boat waste holding tanks in the ocean. Holding tanks must be pumped out into storage tanks on Victory beach pier for transport and disposal at DOE-approved landfill site.

(ii) direct navigation lane between the Victory beach pier and Koh Touch beach on KR island must be established away from the sensitive ecological zones identified in MPA such as coral reefs, fish refugia/spawning and mangroves;

(iv) ferry boats must stay in the navigation lane described above when traveling between Koh Touch beach on KRI and Victory beach in SNL;

(v) refueling must only occur from Victory beach pier from a protected area on the pier that is enclosed away from the public access.