

CLIMATE CHANGE RESILIENCE MEASURES

1. Subprojects in Kampot and Kep provinces include the development of a marine passenger pier and sanitary improvements (Table 1). A detailed description of the proposed subprojects is in the Project Administration Manual. The sustainability of the completed subprojects depends in part on the resilience of the infrastructure to climate change. Of particular interest are the General Circulation Model (GCM) projected changes to sea level, regional average rainfall and wind, and the frequency and severity of storm events which will increase the incidence of inland high water levels in rivers, flooding, and land erosion and landslides.

Table 1: Summary of Planned Infrastructure Subprojects

Subproject	Location and Description
Kampot Pier Development	Kampot Town, Kampot. The subproject will construct a new marine passenger pier comprising: (i) 150 m of embankment stabilization and 50 m jetty with 1,500 m ² landing area; (ii) arrival and departure halls with customs and immigration, administration offices, and commercial space; (iii) parking, public toilet blocks, and supporting infrastructure including power, water supply, and sanitation; The subproject will also upgrade the existing 6.5 km access road linking the pier with Kampot Town.
Kep Crab Market Environmental Improvements	Kep Town, Kep. The subproject will: (i) install anaerobic baffle reactor (ABR) tanks with connections for 33 crab market shops and restaurants with capacity to treat 500m ³ of wastewater per day; (ii) expand the crab market structure and construct additional public toilet blocks; (iii) upgrade the existing parking area, 500 m of internal drainage, walking paths and public open space; and (iv) provide vacuum tankers for routine de-sludging of septic tanks.

m = meters, km = kilometers, m² = square meters, m³ = cubic meters

2. The climate change scenarios for rainfall, air temperature and sea level rise in the coastal subproject areas of Kampot and Kep provinces are essentially identical as the scenarios for adjacent Kien Giang province in southern Viet Nam.¹ Mean annual air temperatures in the two provinces are projected to increase upwards of 0.5 degrees by 2020, with temperatures in the project provinces increasing from 0.4 – 0.5 degrees by 2021. An overall increase in rainfall is expected by 2021 with significant increases in the frequency of severe rainfall and flooding events during the rainy season, but with a general decrease in rainfall during the dry season. Sea level rise in the medium scenario for the coastal zone is 9-10 cm by 2021.

3. The climate resilience measures included in the preliminary design of the subprojects are summarized below.

A. Kampot Pier Development

4. The foundation and shoulders of the upgraded access road to the new pier will be graded to a level that will avoid exposure to future heightened storm surge from Kampot Bay. The road surface will be paved in concrete to resist any potential intrusion of seawater into the road base. Similarly, the parking lot, passenger walkways, buildings, and the pier itself will be

¹ MONRE, 2012. Sea level Rise Scenarios for Viet Nam, abbreviated English Version; UNEP/AIT Regional Resource Centre for Asia and the Pacific, 2013. Assessment, Gaps & Needs for SE Asian Countries for Addressing Impacts, and Vulnerability to Climate Change.

constructed of concrete and raised to elevations above the anticipated heightened storm surges from Kampot bay, and with materials resistant the erosive forces of storm surges. The height of all foundations will be set above projected increases in sea level for the area. Rainfall runoff will be controlled and managed.

B. Kep Crab Market Environmental Improvements

5. Similar to the Kampot Pier facility, new buildings and facilities including the parking area will be constructed above the projected sea level rise for the area. Structures will be built of reinforced concrete and designed to withstand storm surges from Kampot Bay. Rainfall runoff from the surrounding urban area will be controlled and managed. The placement of the ABR septic tank(s) and infiltration gallery will prevent it from being exposed to flooding caused by rain runoff or seawater infiltration.

C. Reduced Greenhouse Gas Footprint

6. The subprojects incorporate climate-friendly infrastructure technology that should reduce greenhouse gas emissions and the carbon footprint of the tourist facilities. Strategies to reduce greenhouse gas emissions are, for example, installation of energy efficient lighting technology at all tourist sites; enforcing directives for tourism transport providers to comply with speed limits along the upgraded access roads; promotion of low-carbon transportation in tourist sites (electric vehicles and human-powered vehicles/walking); and the application of energy efficient technologies for solid waste and wastewater management. The passive, in-field assimilation of wastewater by the ABR septic systems at the Crab Market and Kampot Pier will reduce the emission of methane to the atmosphere. The project will also support the national and provincial tourism authorities to implement the green hotel standard/certification program agreed by the Association of Southeast Asian Nations (ASEAN).²

D. Estimated Incremental Cost of Climate Change Adaption Measures

7. The estimated incremental costs of implementing climate change adaption measures is \$1.2 million or 11% of costs allocated for infrastructure. These costs are mainly incurred due to the need to raise the foundation and shoulders of the access road to the Kampot Pier, and to surface the road with concrete paving. Based on ADB's climate proofing guidelines for the transport sector the amount is considered adequate and will be reassessed at the detailed design stage.³

² ASEAN Secretariat. 2008. *ASEAN Tourism Standards*. Jakarta. There are 6 standards: (i) green hotel, (ii) food and beverage services; (iii) public restroom, (iv) home stay, (v) ecotourism, and (vi) tourism heritage.

³ ADB. 2011. *Guidelines for climate proofing investment in the transport sector: Road infrastructure projects*. Manila