



ADAPTATION FUND

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# CLIMATE CHANGE ADAPTATION THROUGH PROTECTIVE SMALL-SCALE INFRASTRUCTURE INTERVENTIONS IN COASTAL SETTLEMENTS OF CAMBODIA

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Submitted by the United Nations Human Settlements Programme  
(UN-Habitat)



**REQUEST FOR PROJECT/PROGRAMME FUNDING FROM THE  
ADAPTATION FUND**

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**UN HABITAT**  
FOR A BETTER URBAN FUTURE

# PART I





ADAPTATION FUND

## PROJECT/PROGRAMME PROPOSAL TO THE ADAPTATION FUND

### PART I: PROJECT/PROGRAMME INFORMATION

Project/Programme Category:	Regular
Country/Cities:	Cambodia
Title of Project/Programme:	Climate change adaptation through protective small-scale infrastructure interventions in coastal settlements of Cambodia
Type of Implementing Entity:	Multilateral Implementing Entity
Implementing Entity:	United Nations Human Settlements Programme (UN-Habitat)
Executing Entities:	National Council for Sustainable Development (NCSD)
Amount of Financing Requested:	US\$ 5,000,000

### Project Summary

The proposed project's main objective is "to enhance climate change adaptation and resilience of the most vulnerable coastal human settlements of Cambodia through concrete adaptation actions, particularly in areas where eco-tourism has the potential to sustain such interventions". It is structured around the following three components:

Component 1: Community-scale knowledge and capacity enhanced to sustain the adaptation benefits of the project's investments (US\$ 275,000)

Component 2: Government planning and technical capacity enhanced to sustain and enhance the project's adaptation benefits (US\$ 275,000)

Component 3: Resilience built through investment in small-scale protective and basic service infrastructure and natural assets (US\$ 3,620,507)

# 1 PROJECT BACKGROUND

## The problem

### *Climate change is a major challenge for reaching national development goals*

In recent years, the Kingdom of Cambodia was among the countries most affected by extreme weather events in the Asia Pacific region.<sup>1</sup> Cambodia constantly ranks among the most vulnerable countries in the world according to the annually published Climate Risk Index<sup>2</sup>, as well as the Climate Change Vulnerability Index<sup>3</sup>. Between 1991 and 2014, extreme hazards, floods and storms led to the deaths of over 1500 people<sup>4</sup> and caused economic losses amounting to more than US\$235 million. Figures show that the country's vulnerability to extreme weather events such as floods, and cyclones cause most losses in terms of both mortality and economic losses.<sup>5</sup>

Cambodia's vulnerability stems from its geography, which exposes it to multiple hazards, and its severely limited adaptive capacity in its physical infrastructure and institutions, stemming from limited financial, technical and human resources.<sup>6</sup> Coastal zones, as well as nationwide infrastructure are amongst the most affected in the country.<sup>7</sup> This also affects the fast-growing tourism sector, especially in coastal areas, on which the economy increasingly relies. Rising sea levels can potentially impact coastal systems in multiple ways, including flood and storm damage, inundation, loss of wetlands, erosion, saltwater intrusion, and rising water tables.<sup>8</sup>

In addition, there is growing risk that severe weather events will impact Cambodia. Climate Change therefore makes it more and more difficult for Cambodia to continue achieving its main national development priority, which is to significantly reduce poverty rates while simultaneously fostering economic growth at a yearly rate of seven per cent, as outlined in its National Strategic Development Plan (NSDP) 2014-2018.<sup>9</sup> And although Cambodia managed to graduate from the status of low income country to lower-middle income country in 2016<sup>10</sup> as intended by its NSDP<sup>11</sup>, the uncertainty and

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1 Global Climate Risk Index, 2015. Online at <https://germanwatch.org/en/9531>

2 Global Climate Risk Index, 2016, p. 23. Online at <https://germanwatch.org/fr/download/13503.pdf>

3 Climate Change and Environmental Risk Atlas 2015. Online at <https://maplecroft.com/portfolio/new-analysis/2014/10/29/climate-change-and-lack-food-security-multiply-risks-conflict-and-civil-unrest-32-countries-maplecroft/>

4 Global Climate Risk Index, 2016, p. 23, online at <https://germanwatch.org/fr/download/13503.pdf>. UNISDR Global Risk Assessment 2017, online at <http://www.preventionweb.net/countries/khm/data/>. The International Disaster Database (EM-DAT), 2017, online at [http://www.emdat.be/country\\_profile/index.html](http://www.emdat.be/country_profile/index.html)

5 Index for Risk Management (INFORM) Country Risk profile for Cambodia, 2017. Online at <http://www.inform-index.org/Countries/Country-profiles/iso3/KHM>

6 INFORM Country Risk profile for Cambodia, 2017. Online at <http://www.inform-index.org/Countries/Country-profiles/iso3/KHM>

7 Cambodia's Intended Nationally Determined Contributions, p. 2. Online at <http://www4.unfccc.int/submissions/INDC/Published%20Documents/Cambodia/1/Cambodia's%20INDC%20to%20the%20UNFCCC.pdf>

8 Second National Communication to the UNFCCC, p. xv. Online at <http://unfccc.int/resource/docs/natc/khmnc2.pdf>

9 National Strategic Development Plan 2014-2018, p. 4. Online at <http://www.mop.gov.kh/LinkClick.aspx?fileticket=XOvSGmpl4tE%3d&tabid=216&mid=705>

10 The World Bank, 2017. Online at <http://data.worldbank.org/?locations=KH-XN>

11 National Strategic Development Plan 2014-2018, p. 4.

intricacy of increasing climate change risks and threats significantly hampers economic growth and development potential in the future.<sup>12</sup>

### **Economic context**

#### ***Climate change is already causing economic losses but the government faces challenges in terms of financial resources and technical capacity to respond.***

According to most recent statistics published by the World Bank, in 2015 Cambodia's Gross National Income (GNI) amounted to US\$1,070 per capita, growing at 7 per cent per year. This trend is slightly decreasing with forecasted GDP growth rates of 6.9 to 6.8 per cent for the years 2017 and 2018, respectively.<sup>13</sup>

Cambodia's economy is narrowly based however, and driven by four main sectors: garment manufacture for export, tourism, construction and agriculture, with three of those predominantly urban sectors, heavily dependent on building resilient settlements and infrastructure. Agriculture, which is heavily dominated by rice paddy cultivation, is critical to rural and peri-urban areas. The economy of the target communes reflects the national economy and is, due to its coastal location, especially dependent on the tourism, construction and agriculture sectors. Productive share in Cambodia is relatively evenly distributed, with its services sector as the largest contributor at 37.8% of total gross output, followed by the industry sector at 31.3% and the agriculture sector at 30.9%. Intermediate inputs as a share of total cost of production in Cambodia is on average almost equally divided, i.e. 50% comes from domestic resources while the other half is imported.

The tourism sector shows high annual growth rates with high shares in total GDP.<sup>14</sup> The direct contribution of the sector to GDP was around US\$2.3 billion (13.5% of total GDP) in 2015, and is forecast to rise by 6.3% per annum between 2016-2025, to US\$4.58 billion (12.4% of total GDP) in 2025. Total contribution to GDP amounted to US\$5.09 billion (29.9% of GDP) in 2015, and is forecasted to rise by approximately 6.5% annually to US\$10.32 billion (28.0% of GDP) in 2025. In 2014, the total contribution of tourism to employment, including jobs indirectly supported by the industry, was 26.4% of total employment (2,221,500 jobs). This is expected to rise by 3.3% per annum to 3,199,000 jobs in 2025 (32.6% of total).<sup>15</sup> In the same year tourism investment was US\$0.4 billion, or 15.6% of total investment. It is expected to rise by 6.4% per year within the next decade to US\$0.8 billion in 2025 (14.1% of total).

The share of foreign visitors in 2015 amounted to nearly 15% of total visitors to the coastal area.<sup>16</sup> Securing continued economic, employment as well as investment growth will heavily dependent on the country's resilience along its coastal lines. Visitors to Preah Sihanouk and Kep have increased year by year. Based on the Provincial Investment Programme report, 2,032,881 tourists visited Preah

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12 Cambodia Climate Change Strategic Plan 2014-2023, p. xv. Online at <http://www.bb.undp.org/content/dam/cambodia/docs/EnvEnergy/CCCAPProjects/Cambodia%20climate%20change%20strategic%20plan%202014-2023.pdf>

13 The World Bank, 2017. Per capita GNI is displayed using the World Bank's Atlas method, which smoothens a country's GNI per capita by price variations and exchange rate fluctuations, taking into account the year of observation and the two previous years. It further adjusts the country's own and the international rate of inflation, with the international inflation rate being the euro area, the United Kingdom, the United States and Japan since 2001. Online at <http://databank.worldbank.org/data/reports.aspx?source=2&country=KHM>

14 Cambodia Climate Change Strategic Plan 2014-2023, p. xv.

15 Word Travel and Tourism Council, Economic Impact 2015 Cambodia. Online at <https://www.wttc.org/-/media/files/reports/economic%20impact%20research/countries%202015/cambodia2015.pdf>

16 Cambodia Tourism Statistics Report, 2015, p. 5.

Sihanouk in 2016, a 16.65 percent increase compared to 2015. As for Kep, visitors increased from 761,206 in 2015 to 1,079,493 in 2016.

Both provinces recognize tourism as an important industry and both provinces have a great potential for eco-tourism, with nature, livelihood, and community-based tourism activities. However, the tourism sector is also affected by climate change, especially beach erosion, as described in the Environmental Section below. For adaptation to climate change, natural resource enhancement and preservation is therefore necessary, as well as improvement of drainage and the management of water supply, sewage and waste. This will benefit tourism potential directly but also the poor and vulnerable, especially from livelihoods and basic services perspective.

Since the initial concept note was developed however, there has been a substantial change in the tourism model in the municipal area of Sihanoukville. The city has attracted very rapid and substantial investment, primarily from China. This has had profound changes in land management in the city, with up to 100 new hotels and other tourist facilities either opened in the last two years or under development. The city has seen up to 78,000 new residents, primarily from China, move to the city in the last year.<sup>17</sup> Because of this rapid change, the proposal no longer focuses its activities on the city of Sihanoukville. This is because the situation is still developing, and UN-Habitat and the Royal Government of Cambodia see undue investment risk in Sihanoukville City. Surrounding districts (such as Prey Nob) are unaffected by the rapid development.

## *Social context*

***Although the government recognizes the importance of resilience to natural disasters in the poor communities, they face limited financial resources and human capacity as well as comprehensive data sets.***

Cambodia has a total population of 15.58 million (of which around 51.3 per cent are women) and this figure is growing at a rate of 1.6 per cent annually. Urban areas are growing much more rapidly at 2.6 per cent each year.<sup>18</sup> This is one of the main reasons for the country's increasing demographic pressures over the past years. According to the Fragile States Index, in 2016 Cambodia was one of the few countries in the region that were labelled a high warning status with regard to its state of development, which even marginally worsened within the last decade.<sup>19</sup> And although the country has a relatively high share of payments to labour in relation to its GDP compared to its neighbouring countries,<sup>20</sup> uneven economic development only shows slightly improving trends.<sup>21</sup> While household poverty rates are highest in the north-east of the country, overall poverty rates remain high in the coastal area ([Figure 1](#), left), especially considering its higher population density.

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<sup>17</sup> <https://www.channelnewsasia.com/news/cnainsider/china-belt-road-casino-boom-sihanoukville-cambodia-phnom-penh-10846730>

<sup>18</sup> Displays data for the most recent available year 2015. The World Bank, World Development Indicators, 2017. Online at <http://databank.worldbank.org/data/reports.aspx?source=2&country=KHM>

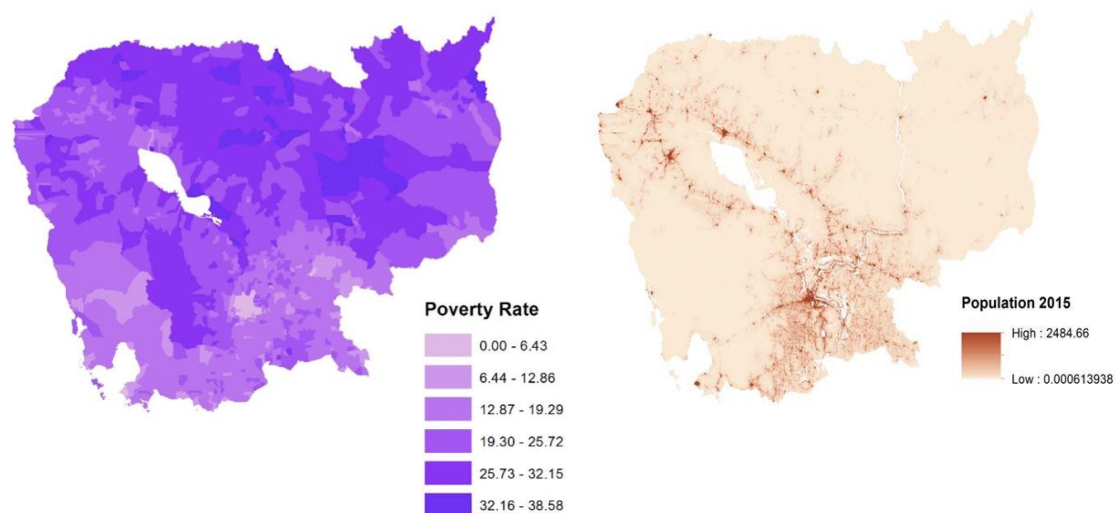
<sup>19</sup> The Fund for Peace 2017. Online at <http://library.fundforpeace.org/library/fragilestatesindex-2016.pdf>

<sup>20</sup> 56% of its economic gains are invested into labour force. Secretario, F. et al. 2009, p. 9. Online at <http://depocenw>

[p.org/modules/download/index.php?id=62](http://modules/download/index.php?id=62)

<sup>21</sup> The Fund for Peace 2017.

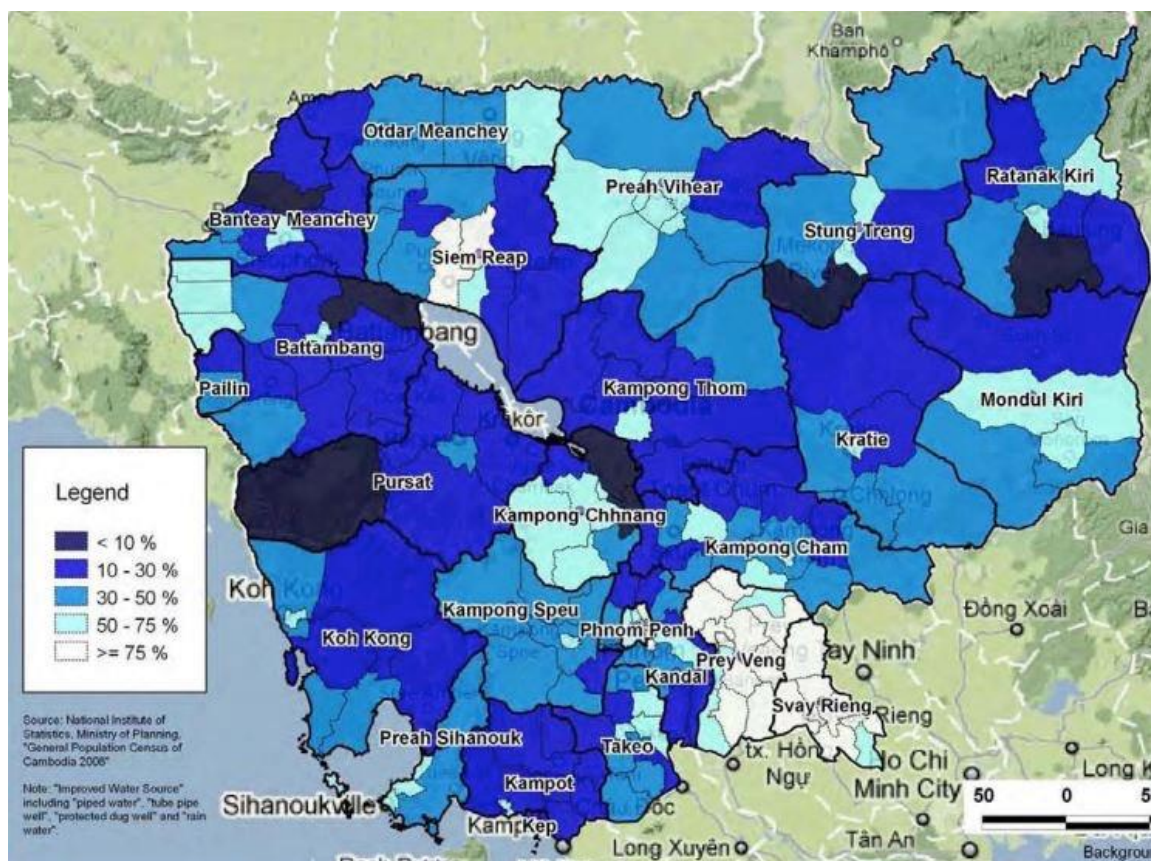
The population density map (Figure 1, right) shows that along the coast the cities of Sihanoukville, Kampot and Kep (from left to right) are among the most populated areas. The country’s coastal population faces challenges such as low levels of education and poor health and basic infrastructure services. It further shows an on-going deterioration of inequality between the mid-1990s and 2007, despite an overall poverty reduction.



**Figure 1** “Distribution (%) of household poverty rates by districts and population density in 2015”

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22 Left: own illustration based on the United Nations Office for the Coordination of Humanitarian Affairs, 2015. Online at Open Development Cambodia. Right: Own illustration based on adjusted UN data from World POP. Online at World POP.



**Figure 2** "Percentage of households with improved water sources"

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The expected impacts of climate change (discussed below), are likely jeopardize poverty reduction and health targets, because hazards are likely to increase in frequency and intensity. This is because poor communities predominantly live in high-risk areas and already lack access to basic services. More frequent storms, inundation and salt water incursion are likely to enhance the spread of water- and vector-borne diseases, limit access to clean water and food, flood and expose unsafe sanitation facilities, and isolate the population from health and other emergency services and responses.

Notwithstanding advances in water, sanitation, and hygiene over recent years, climate change impacts are a present danger and cause loss of life and have long-lasting impacts on poverty and food security. People in the coastal area will be able to adapt to climate change when they have access to basic infrastructure services such as improved water management, drainage, coastal protection and sanitation.

As shown in Figure 2, the overall percentage of households that can access improved water sources is still low, ranging in most districts between 10 and 30 per cent. Prey Nong District, one of the two target areas for this project, is in-line with the national average, while Kep Province does not have any access to piped water.

23 Japan International Cooperation Agency, 2010, p. iv. Online at JICA



Although the government intends to expand and improve basic infrastructure services throughout the country, the development and implementation of effective climate change strategies is constrained by limited financial resources and human capacity, a lack of reliable and comprehensive data sets, research to support greenhouse gas inventories, and vulnerability assessments. Natural disasters, intensified by climate change, have major impacts on basic services and need to be consequently addressed through adaptation measures as a means to alleviate poverty and foster economic growth.

In line with the government's Nationally Determined Contribution (NDC) under the Paris Agreement on Climate Change, an approach to establish this should focus on the resilience of coastal zones and infrastructure more generally as they are among the areas impacted most severely by climate change.

### *Environmental context*

#### ***Sea level rise due to climate change and changes of the mangrove systems accelerate coastal erosion and reduce the climate change resilience.***

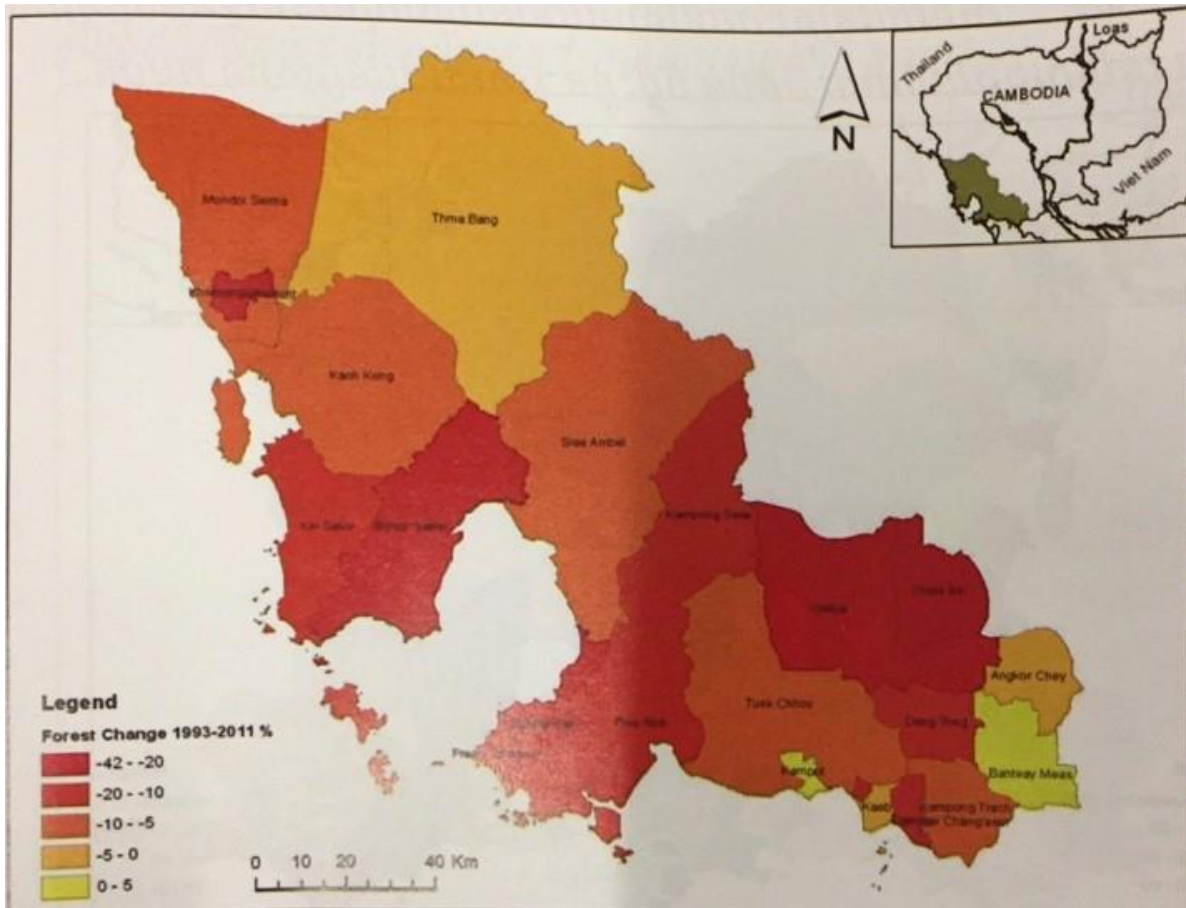
The Ministry of Environment has identified forests, including mangrove forest, as vital in maintaining the country's ecosystems as well as a source of various non-timber forest products. 27 per cent of Cambodian land is categorized as protected forest area. In Preah Sihanouk, 26 per cent of the land is categorized as protected forest area. In Kep this figure is 7 per cent<sup>24</sup>.

Deforestation is taking place in the coastal area, and the cutting of mangrove forests is a particularly pressing issue. IUCN has identified up to 4,000 hectares of former mangrove that has been converted into salt farms in Kep Province and neighbouring Kampot province alone. A study by the Ministry of Environment (MoE et al. 2014) shows that mangroves in Prey Nob District in Preah Sihanouk Province are under threat by salt, charcoal use, and industrial development, as shown in Figure 3<sup>25</sup>.

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<sup>24</sup> MoE, GEF and UNEP (2013), p. 31.

<sup>25</sup> 3rd State of the Coastal Environment, Climate Change and Socio-Economy Report 2013



**Figure 3** “Percentage reduction in forest area at the district level from 1993 to 2011”

An estimated 3,446 hectares of land area in Preah Sihanouk Province and 343 hectares of Kep Province will be below mean sea level if the sea level rises by 1 metre in the future. The study by the Ministry of Environment also estimated that 3,530 hectares of mangroves in Preah Sihanouk Province and 13 hectares in Kep Province are located within 1 metre above today’s mean sea level. Therefore, simultaneous occurrence sea-level rise and mangrove cutting for land use change will accelerate coastal erosion as well as reduce the adaptive capacity to climate change of the coastal ecosystem.<sup>26</sup>

Severe environmental degradation has taken place throughout the coastal area of Cambodia – especially in areas where there has been investment in infrastructure and tourism. Besides that, the often-informal nature of the target settlements creates environmental problems, especially in waste management. Moreover, the combined effects of sea-level rise, coastal flooding and on-shore development issues (especially disposal of wastewater) are causing coastal erosion.

<sup>26</sup> MoE, GEF and UNEP (2013), p. 190.





## *Climate change projections and expected impacts in the target area*

### ***Climate change projections***

Cambodia's climate is governed by a monsoon weather cycle, with a wet season between May to November that is dominated by heavy rainfall and average temperatures of 28°C and a dry season from November to May, with an average maximum temperature of 38°C in April and an average minimum temperature of 17°C in January. Over the last decades, mean temperatures in Cambodia have increased significantly, a trend that is predicted to continue with projected increases in monthly averages between 0.013°C and 0.036°C per year by 2099 with higher predictions for locations at low latitudes.<sup>2728</sup>

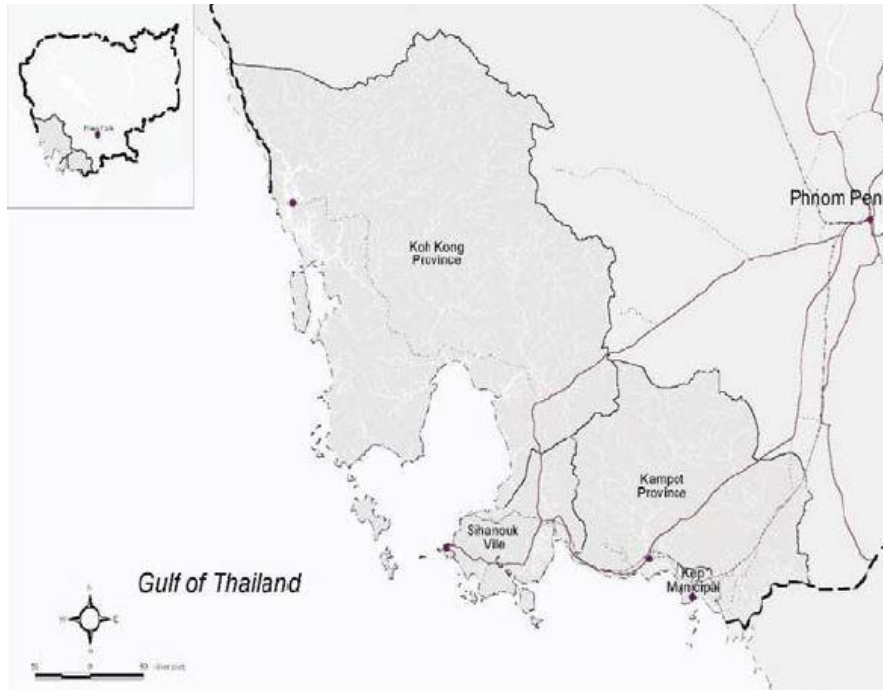
Rainfall varies within the country and is strongly influenced by topography, declining in the central plains, and increasing in the upland areas. However, rainfall is heaviest along the 435km coastline stretching from Koh Kong Province bordering Thailand in the west, Sihanoukville Municipality which contains Cambodia's largest deep-water sea port, Kampot Province bordering Vietnam to the East, and Kep Province (see Figure 4). While lowlands may receive average annual rainfall of 1400mm per year, data shows that rainfall within coastal areas can be as high as 4000mm per year or higher (see Figure 5).<sup>29</sup>

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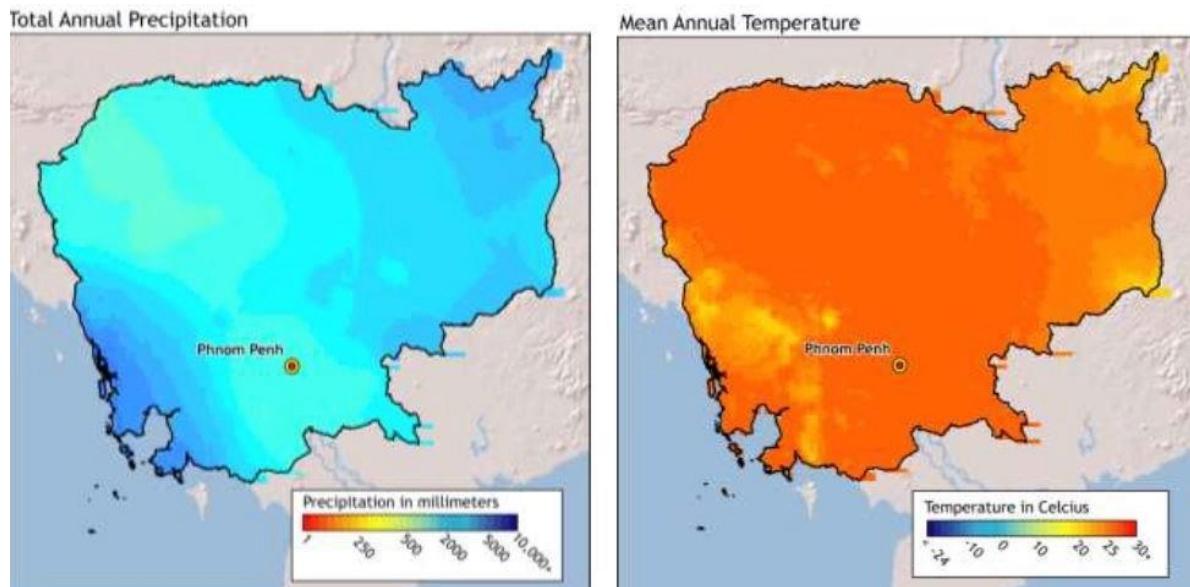
27 Cambodia Climate Change Strategic Plan 2014-2023, p. 8.

28 Caption: Cambodia Coastal Situation Analysis, 2011, p. 6. Online at [http://cms.daa.iucn.org/downloads/cambodia\\_coastal\\_situation\\_analysis\\_final.pdf](http://cms.daa.iucn.org/downloads/cambodia_coastal_situation_analysis_final.pdf)

29 Heng Chan Thoeun, 2015, p. 63. Online at <http://dx.doi.org/10.1016/j.wace.2015.02.001>



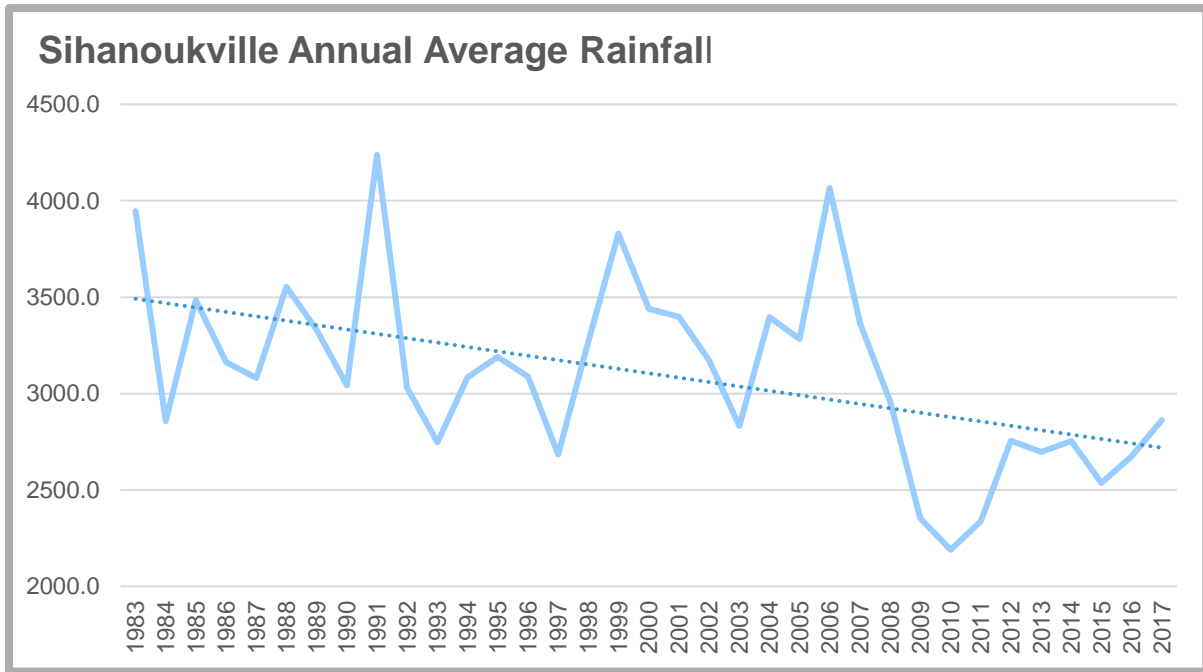
**Figure 4** “Cambodia's Coastal Provinces”



**Figure 5** “Rainfall and Temperature Baseline Situation in Cambodia”

### *Observed Trends, Hazards and Impacts*

Due a history of civil conflict, there are only very few long-term historical datasets available for climate observations in Cambodia. However, a long-term dataset for Sihanoukville (the capital of Preah Sihanouk Province) was obtained, and it shows that annual average rainfall has substantially decreased in the last 35 years; the average rainfall in 2017 is now 20 per cent lower and if current trends continue, rainfall will continue to decline by 0.76% per cent per year, as shown in Figure 6.



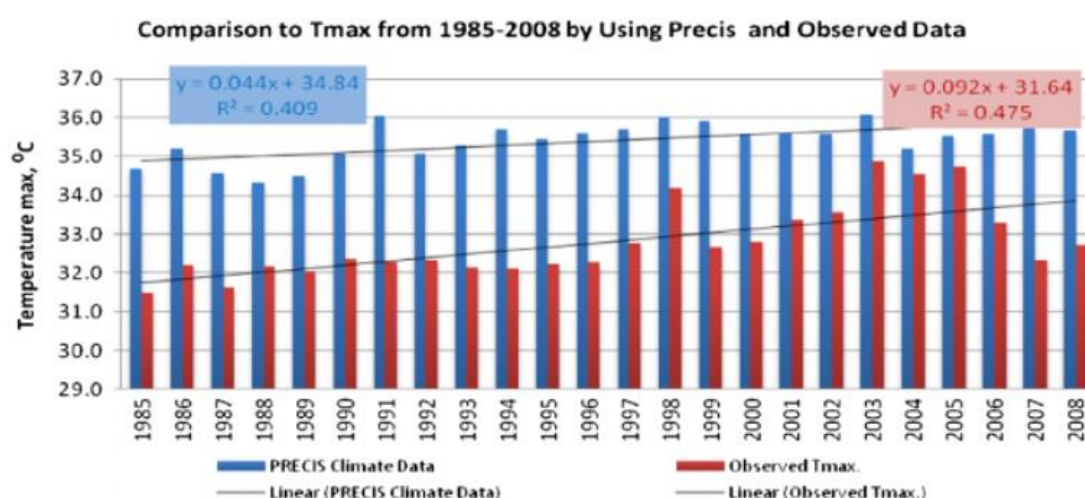
**Figure 6** “35-year rainfall in Sihanoukville”

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Temperatures have too shown a significant increase in recent years. As shown in Figure 7, average annual maximum temperatures increased about 1.3°C between 1985 and 2008. This correlates with community level discussions with local people during the formulation of this proposal, where increased temperatures were the most frequently cited observable impact of climate change along the coastal area. Increasing temperatures also combined with decreasing rainfall to create pressure on water resources, as greater amounts of water evaporate into the atmosphere.

*30 The authors, based on data provided by the Provincial Department of Water Resources and Meteorology, Preah Sihanouk Province*

**Figure 7 “Annual Maximum Air Temperatures in Cambodia”**



**Fig. 5.** Observed and predicted annual maximum air temperatures.

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The Intergovernmental Panel on Climate Change (IPCC), however, provides an overview of forecasting trends from 21 climate models for Southeast Asia. This summary states that i) for the period 2081-2100 temperatures will likely increase in the range of 1.5°C to 3.7°C; ii) while the number of hot days and nights will increase, cold days and nights will likely to become less frequent; iii) rainfall will most likely increase with projections ranging from a decrease of 2% to increases of up to 15%, with projected increases in the intensity of precipitation; iv) sea-levels in the region are forecasted to rise between 0.18 and 0.56cm by the year 2100, though some research has projected sea-level rises in the region of around 1 metre.<sup>32</sup>

### **Current and Expected Future Impacts**

Cambodia is vulnerable to droughts, floods and sea-level rise. The coastal area is also increasingly affected by strong winds, which are often associated with the onset of thunderstorms.

In 2011, floods resulted in the loss of around 4 per cent of gross domestic product<sup>33</sup>. Likewise, the 2013 floods caused economic losses of around US\$356 million, of which US\$153 million was the estimated value of the destruction of physical assets (damage) in the affected areas, and US\$203 million the estimated losses in production and economic flows.<sup>34</sup>

Increases in sea levels are especially alarming for Cambodia’s coastal areas that are already experiencing severe seawater intrusion, beach erosion, high tides, and frequent storm surges.

31 Heng, CT (2015) *Observed and projected changes in temperature and rainfall in Cambodia*, *Weather and Climate Extremes*, 7, pp61-72, p.66

32 See for example Rahmstorf, S., 2007 and Ananthaswamy, A., 2009.

33 2011 GDP (current US\$) amounted to US\$12.83 billion (World Bank, online at <http://data.worldbank.org/country/cambodia>).

The 2011 flood resulted in total economic losses of around US\$0.521 billion (EM-DAT country profile).

34 Cambodia’s *Intended Nationally Determined Contributions*, p. 3.



Additional impacts such as land subsidence in the region may even further intensify its effects.<sup>35</sup> Especially low-lying areas such as coastal settlements, seaports, coastal fisheries, mangrove forests, and tourism facilities are increasingly affected. The effects of sea-level rise are also being exacerbated by the declining trend in rainfall, as in dry years less water in the rivers allows for greater sea-water incursion.

Figure 8 shows that numerous areas along Cambodia's coast, including Prey Nob District and Kep Province, are likely to be affected by 1 metre sea-level rise. This area includes all eleven of the communes targeted by the investment component of this project.

In addition, substantial salt water incursion and coastal erosion has been observed throughout the coastal area, including in all eight of the target communes. Considering the topography of the area; primarily flat coastal plain, characterised by rice paddy and poor settlements, erosion and seawater incursion is having a substantial impact on the ability of people to source their livelihoods. Figures 9 and 10 show coastal erosion in the target areas of the project.

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<sup>35</sup> Erban, L.E., Gorelick, S.M. and Zebker, H.A., 2014, p. 1. Online at <http://iopscience.iop.org/article/10.1088/17489326/9/8/084010/pdf>

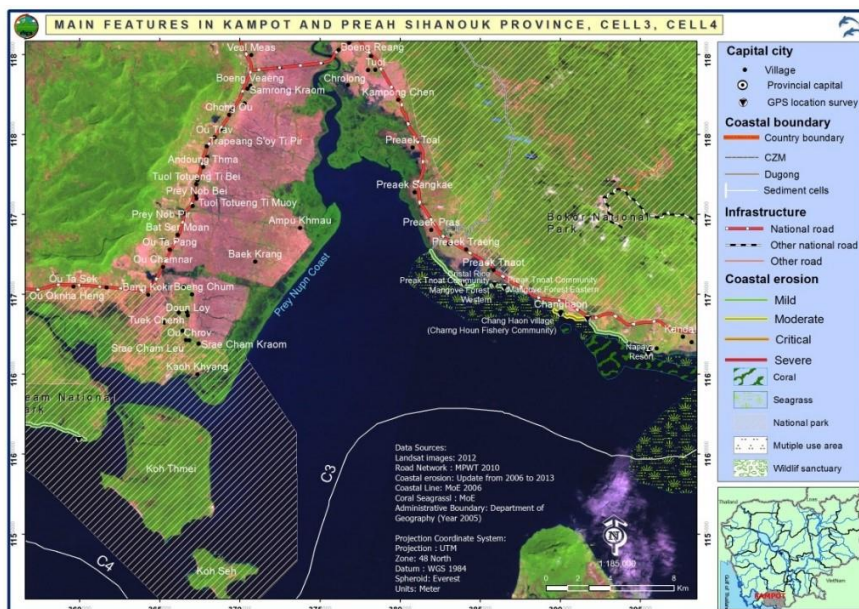


**Figure 9** “Coastal Erosion in Kep Province”



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**Figure 10** “Areas that would be critically affected by 1-metre sea-level rise”



37 MoE and UNEP (2014) - VULNERABILITY ASSESSMENT AND ADAPTATION PROGRAMME FOR CLIMATE CHANGE WITHIN THE COASTAL ZONE OF CAMBODIA CONSIDERING LIVELIHOOD IMPROVEMENT AND ECOSYSTEMS, p.8

## *Focus of the Proposal*

As described detail in the following section, the main objective of the proposed project is to enhance climate change adaptation and resilience of the most vulnerable coastal human settlements of Cambodia through concrete climate change adaptation actions, particularly in areas where eco-tourism has the potential to sustain such interventions.

To achieve this objective, the project focuses its actions on highly vulnerable settlements in Kep Province and Prey Nob District of Preah Sihanouk Province. All areas are along Cambodia's coastal area, a priority area for adaptation defined by the Ministry of Environment. In Kep Province, the project will target four sangkats/communes<sup>39</sup>, with a total of 28,021 direct beneficiaries of the project's interventions. In Prey Nob District (in Preah Sihanouk Province), the project will target seven communes, with a total of 34,500 beneficiaries. Further in-depth information about the proposed beneficiaries can be found in [Annex 1](#).

There are numerous climate hazards in the project's target area, as alluded to above. Sea-levels are rising, which, coupled with declining water flow (partially as a result of reduced rainfall), means that salinity is encroaching ever further in land. Commune leaders and individual households indicated that within the last few years, in many areas salinity has penetrated all the way to the main Kep to Preah Sihanouk highway – an unprecedented condition. Meanwhile, storm surges in the rainy season can affect the low coastal plains that characterise much of the project's target area.

Linked to this, surface and ground water availability is decreasing. In Kep Province, for example, inadequate reservoirs mean that people have insufficient water access and water is being wasted. A lack of distribution infrastructure also means that there is no water supply. In Teuk Thla, Teuk La'k and Samaki Communes in Prey Nob District, ground water wells have either gone dry or have been permeated with sea-water, while in the remaining five communes of Prey Nob, water is also either saline or heavily polluted. Declining rainfall is driving the reduction in water availability, and poor management is exacerbating the problem.

Also linked to rising sea-levels and various land-based human factors such as salt farming is coastal erosion. The flat coastal plains that characterise the project area are all experiencing coastal erosion to some degree, with the problem being especially pressing in areas that are not protected by mangrove, and or those that have poor water management, such as Angkaol Commune in Kep Province.

Meanwhile strong winds associated by thunderstorms damage houses. In each of the 11 communes surveyed by the project formulation team, up to 200 houses are destroyed by strong winds every year and many more are damaged. While observed wind speeds in the target area are not high (registering highest recorded wind speeds of between 60-80 kilometres per hour), the resilience of housing is very low – people often use basic construction techniques and poor-quality materials.

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*38 Ibid, p.28*

*39 Note that sangkats and communes are the same level of local government. A unit of local government is referred to as a Sangkat in urban areas and a commune in rural areas.*

The target areas for the project can be viewed through two interactive maps, for [Kep Province](#) and [Prey Nob District](#)

The following table gives a brief overview of the main climate hazards that impact the target area and the hard investments proposed by the project to adapt to them. It also relates these to the underlying vulnerabilities/barriers to adapt. This table summarises information derived from the consultations that took place in formulating the proposal. These consultations are detailed further in [Part II, Section H](#). More details can be found in the action planning documents provided in [Annex 1](#) and in the investments proposed under Component 3, introduced in [Part II, Section A](#) and detailed in full in [Annex 2](#).

**Table 1**

*Summary of Climate hazards and underlying vulnerabilities in the target area*

Climate Change Hazard	Impact at Community Level	Underlying Vulnerability/Barriers to Adaptation	Target Communes Affected	Investments Proposed
Strong wind	<p>Destroyed or damaged houses</p> <p>Damage to crops</p> <p>Coastal erosion</p> <p>Limited ability to find shelter</p> <p>Fishing boats capsize</p>	<p>Poor house construction</p> <p>Limited education, skills and capacity to make housing more resilient</p> <p>Limited access to finance</p> <p>Lack of weather information, broadcasts/early warning systems</p> <p>Deforestation</p>	<p><b>Prey Nob District:</b> Teuk Thla, Teuk La'k, Samaki</p> <p><b>Kep Province</b> Angkaol and Pong Teuk</p>	<p>Train local people on resilient housing construction techniques (Output 3.5)</p> <p>Install tide gauge and broadcast system (Output 3.8)</p>
Sea level rise and saline intrusion	<p>Unusable ground water</p> <p>Declining agricultural output/inability to grow crops</p> <p>Coastal erosion, including the loss of beach and productive land along the coast</p> <p>Soil infertility</p>	<p>Poor water management and insufficient infrastructure</p> <p>Loss of mangrove forest</p> <p>Salt farming and other damaging land use practices</p>	<b>All target communes</b>	<p>Mangrove restoration (Output 3.1)</p> <p>Raised sea-wall, embankment and Watergate repair (Output 3.6)</p>
Drought	<p>Lack of water in reservoirs – leading to a lack of water for drinking and</p>	<p>Old and insufficiently maintained reservoirs</p> <p>Lack of supporting infrastructure, such as canals and water gates</p>	<b>Kep Province –</b> Pong Teuk and Angkaol Communes	<p>Rehabilitation of O Thmar Reservoir and Bank strengthening work at Roness Reservoir to</p>

	<p>agricultural purposes</p> <p>Poor crop yields, leading to low incomes</p> <p>Poor soil quality</p>	No water supply/distribution system		<p>provide additional water retention and safety. (Output 3.4a and b)</p> <p>Channels and Embankments construction (Output 3.3)</p> <p>Water gate repairs (Output 3.2 (a))</p>
<p>Flooding</p>	<p>Inundation of urban areas, especially markets, infrastructure and houses</p> <p>Contamination with dirty water</p> <p>Health issues</p> <p>Loss of income</p>	<p>Lack of drainage</p> <p>Lack of other water management</p> <p>Pollution from waste water and solid waste</p>	<p><b>Kep Province</b> Angkaol and Pong Teuk Communes</p> <p><b>Prey Nob District</b>  Veal Rinh, Ou Ohkna Heng and Prey Nob Communes</p>	<p>Channels and Embankments construction (Output 3.3)</p> <p>Water gate repairs<sup>40</sup> and canal rehabilitation (Output 3.2a and b)</p> <p>Market Rehabilitation (Veal Rinh) (Output 3.7)</p> <p>Raised sea-wall, embankment and Watergate repair<sup>41</sup> (Output 3.6)</p>

**Table 2**

*Population of the Target Communes*

Municipality/District	No.	Name of Sangkat/Commune	Total Population*	Female Population	Location
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<sup>40</sup> Please note that the channels and embankments construction and water gate repairs are designed to adapt to both floods and droughts

<sup>41</sup> Please note that the raised sea wall, embankment and water gate repair is designed to prevent both flooding and salt water incursion

Prey Nob District	1	Tuek Thla	5,455	2,720	Coastal
	2	Tuek L'ak	4,413	2,198	Coastal and River
	3	Samakki	3,641	1,919	Coastal and River
	4	Veal Rinh	10,717	5,636	Coastal and River
	5	O Chrou	6,053		Coastal and River
	6	Prey Nob	7,944	3,976	Coastal and River
	7	Ou Oknha Heng	9,006	4,559	Coastal and River
		<b>Sub-Total</b>	<b>47,229</b>	<b>24,332</b> <b>(50.85%)</b>	
Kep Province	1	Angkaol	8,566	4,280	Coastal
	2	Pong Tuek	10,987	5,574	Coastal
	3	Prey Thom	8,521	3,994	Coastal
	4	Kep	4,917	2,358	Coastal
	<b>11</b>	<b>Sub-total</b>	<b>32,991</b>	<b>16,206</b> <b>(48.92%)</b>	

Table 3 below, shows the poverty rate and the percentage of people whose primary water source is considered unsafe, for communes in Prey Nob District and Kep Province, according to the vulnerability assessment carried out by the Ministry of Environment in 2015. It clearly shows that a lack of access to safe water is a critical underlying vulnerability.

**Table 3**

*Poverty level and people with unsafe water.*

Municipality/ District	No	Name Of Sangkat/ Commune	Poverty (%)	Sensitivity			
				Unsafe Water (%)	No. With Unsafe Water	Total Sensitivity	Over-All Vulnerability Index
Prey Nob District	1	Tuek Thla	20.2	50.5	2,754	67	5
	2	Tuek L'ak	20.1	47.6	2,100	62	5
	3	Samakki	19.2	70.3	2,559	61	5
	4	Veal Rinh	26.3	24.5	2,625	47	3
	5	O Chrou	19.8	91.8	6,134	73	3
	6	Prey Nob	18.6	96.1	7,634	56	5
	7	Ou Oknha Heng	18.0	71.0	6,394	76	5



Kep Province	1	Angkaol	18.5	77.1	6,604	67	5
	2	Pong Tuek	18.5	88.5	9,723	66	4
	3	Prey Thom	14.3	90.9	7,745	57	4
	4	Kep	6.4	99.1	4,872	50	3

<b>TOTALS</b>	<b>17,528</b> (people below poverty line)		<b>73,043</b>		
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## 2.0 PROJECT OBJECTIVES

### *Main objective*

The proposed project’s main objective is to enhance climate change adaptation and resilience of the most vulnerable coastal human settlements of Cambodia through concrete adaptation actions, particularly in areas where eco-tourism has the potential to sustain such interventions.

To accomplish this, and to respond to the previous comments of the Adaptation Fund secretariat, the project proposes three specific objectives, or ‘components’, which are also summarised below in Table 4.

**Component 1:** Community-scale knowledge and capacity enhanced to sustain the adaptation benefits of the project’s investments

- This is in line with:
  - Adaptation Fund Outcome 3 – Strengthened awareness and ownership

of adaptation and climate risk reduction processes at local level

**Component 2:** Government planning and technical capacity enhanced to sustain and enhance the project’s adaptation benefits

- This is in line with:
  - Adaptation Fund Outcome 2 – Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses

To a lesser extent, this component also addresses:

- Outcome 4 – Increased adaptive capacity within relevant development and natural resource sectors
- Outcome 7 – Improved integration of climate-resilience strategies into country development plans

**Component 3:** Resilience built through investment in small-scale protective and basic service infrastructure and natural assets

- This is in line with:
  - Adaptation Fund Outcome 2 – Increase adaptive capacity with relevant development and natural resource sectors,
  - Adaptation Fund Outcome 5 – Increase ecosystem resilience in response to climate change and variability-induced stress,
  - Adaptation Fund Outcome 6 – Diversified and strengthened livelihoods and sources of income for vulnerable people in targeted area.

## 3.0 PROJECT COMPONENTS AND FINANCING

Table 4

### *Project Components and Finance*

Project Components	Expected Concrete Outputs	Expected Concrete Outcomes	Amount (US\$)
Component 1  Community-scale knowledge and capacity enhanced to sustain the adaptation benefits of the project's investments	Output 1.1.  Community capacity built to collect and manage solid waste and waste water	Outcome 1.  Communities in the target areas are able to manage their infrastructure, maintain its functionality and autonomously adapt to the future impacts of climate change	100,000
	Output 1.2.  Communities in target areas have been trained on resilient house construction techniques		75,000
	Output 1.3.  Communities have been organised to manage, monitor and maintain the infrastructure investments under Component 3		100,000
	<b>TOTAL</b>		<b>275,000 6.59%</b>
Component 2  Government planning and technical capacity enhanced to sustain	Output 2.1.  Government officers at the provincial and district levels trained to plan effectively for	Outcome 2.  Capacity enhanced at the provincial and district level to	100,000

and enhance the project's adaptation benefits	sustaining and enhancing the project's adaptation benefits	manage, monitor and maintain the project's benefits, as well as enhance and replicate its approach.	
	Output 2.2 Government officers at the provincial and district provided with comprehensive technical training to manage, operate and maintain the infrastructure		<b>100,000</b>
	Output 2.3 Institutional systems strengthened to monitor adaptation investments and replicate their benefits		<b>75,000</b>

<b>TOTAL</b>	<b>275,000 6.59%</b>
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Component 3 Resilience built through investment in small-scale protective and basic service infrastructure and natural assets	Output 3.1. 285ha of Mangroves restored in Kep and Angkaol Communes, Kep Province	Outcome 3. At least 62,521 people have access to protective natural and social assets and/or benefit from physical infrastructure to reduce the climate vulnerability. (AF outcome 4 and 5)	\$208,704
	Output 3.2 Water gates repaired in 3 locations in Pong Teuk and Angkaol (a)		\$5,328 (a)
	2 canals rehabilitated in Pong Teuk and Angkaol Communes, Kep Province (b)		\$76,050 (b)
	Output 3.3 Prevention of salt water ingress through improved channels		\$246,000

	Output 3.4		
	3.4a O Thmar Reservoir rehabilitated to increase water storage capability Kep Province		\$660,040
	3.4b Bank strengthening work at Roness Reservoir to provide additional water retention and safety.		\$1,304,000
	Output 3.5		\$89,000
	Resilient Housing designs developed and demonstrations constructed (Both provinces)		
	Output 3.6		\$266,100
	Raised embankment and Watergate repair in Ou Ohkna Heng Commune, P. Sihanouk Province		
	Output 3.7		\$712,905
Drainage and Rainwater Harvesting installed at Veal Rinh Market, P. Sihanouk Province			
Output 3.8		\$52,380	
Tide gauge with early warning system broadcast capabilities installed (Tide Gauge in Ou Okhna Heng Commune, Prey Nob District)			
	<b>TOTAL COMPONENT 3</b>		<b>3,620,507</b> (86.81% - Total for Component 3)
	5. Project/Programme Execution cost (9.5 %)		<b>437,788</b>
	6. Total Project/Programme Cost		<b>4,608,295</b>

7. Project/Programme Cycle Management Fee charged by the Implementing Entity (if applicable) (8.5 %)	<b>391,705</b>
<b>Amount of Financing Requested</b>	<b>5,000,000</b>

### Projected Calendar:

<b>MILESTONES</b>	<b>EXPECTED DATES</b>
Start of Project/Programme Implementation	09-2019
Project/Programme Closing	09-2023
Terminal Evaluation	12-2023

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# PART II

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## PART II: PROJECT / PROGRAMME JUSTIFICATION

### A. PROJECT COMPONENTS

As the introduction to this proposal notes, Kep Province and Prey Nob District, the target areas of this proposal, are highly exposed to multiple hazards; sea-level rise, increasing temperatures and dramatically changing rainfall patterns, which in turn cause drought, strong winds and flooding, salt water incursion and coastal erosion. Underlying vulnerability to those hazards, in the form of poverty, inadequate infrastructure, a lack of basic services, ecosystem degradation and mismanagement of water resources exacerbate their impacts and make the target area highly vulnerable to climate change.

To achieve the project's overall objective; "to enhance climate change adaptation and resilience of the most vulnerable coastal human settlements of Cambodia through concrete adaptation actions, particularly in areas where eco-tourism has the potential to sustain such interventions'. The project works with national and sub-national government to achieve adaptation through improved protective and basic service infrastructure, ecosystems, and capacity at the community and local government level.

The actions proposed by the project have been designed to target the poorest and most vulnerable people in two of Cambodia's most vulnerable areas; Kep Province and Prey Nob District (in Preah Sihanouk Province). To do this, an interdependent set of soft and hard measures has been proposed to ensure that resilience at the household and commune level is strengthened sustainably. The soft measures focus on increasing community capacity and the capacity of officials and institutional systems at the sub-national level. All capacity building activities are designed to support, enhance and sustain the 'hard' investments that the project will make. Such an approach is also in line with Cambodia's Nationally Determined Contribution of "promoting and improving the adaptive capacity of communities, especially through community-based adaptation actions (..) and, "strengthening technical and institutional capacity... and mainstreaming of climate change into sector and sub-sector development plans".

The hard investments made by the project will all be in small-scale protective and basic service infrastructure and ecosystems. These investments have been fully identified, costed and through a comprehensive environmental and social safeguard compliance analysis. They are presented in brief below and in full in [Annex 3](#).

The specific needs of women, people with disabilities and youths will be considered at all stages of the project. Extensive consultations have been conducted in formulating the project proposal, which are detailed in [Part II, Section H](#) and in [Annex 1](#), while the implementation will use, where possible, the people's process, where community groups are formed and sustained throughout all stages of the project and through which communities participate in project implementation and monitoring.<sup>42</sup> At the community level, women will have a decisive stake in the implementation of the project. All

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*42 Development driven by people/Support Paradigm: when people stays at the centre of development planning process, the resource can be optimized with greater utility impacting larger number of people: <http://sopheapfocus.com/wp-content/uploads/2010/06/Picture-31.png> People's process of development can be witnessed through the evolvement of people's desire to improve their lives. Humans developed their settlement from living in caves, then building shelters, and now home. Along this settlement evolution, they had also established certain norms, standards, and a mutual understanding surrounding their community. That is called the people's process of development.*

commune level committees and groups working under the People's Process will be made up of 50% women. Women will also contribute their labour equally at the community level, and will be encouraged to participate in the physical works. Women will make up at least 30 per cent seats on the national and provincial level committees. In Cambodia, data suggests that women are still very underrepresented in government positions. In 2015 it was estimated that only 16.5 per cent of commune councillors, 11.3 per cent of undersecretaries of state and 19.5 per cent of parliamentarians were women.<sup>43</sup>In this regard, 30% women in decision-making positions represents a high watermark of representation

The components of the project are as follows:

**Component 1:** Community-scale knowledge and capacity enhanced to sustain the adaptation benefits of the project's investments

- This is in line with:
  - Adaptation Fund Outcome 3 – Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level

This component is made up of three outputs, which are also shown in [Table 4](#):

- 1.1) Community capacity built to collect and manage solid waste and waste water
- 1.2) Communities in target areas have been trained on resilient house construction techniques
- 1.3) Communities have been organised to manage, monitor and maintain the infrastructure investments under Component 3

This component works directly with the communities in the target areas and is critical to the sustainability of the investments planned under Component 3.

Activities under Output 1.1. are critical because waste water and especially solid waste are ongoing problems in the target area. In several communes in the target areas, communities and commune leaders reported that their drainage or water management infrastructure was inadequate. However, upon inspection by the project team this infrastructure was completely blocked by solid waste, much of which had originated from the local area. With this in mind, management of solid waste becomes a critical issue; critical infrastructure, and especially activities to repair water gates, canals and embankments (see Output 3.2a, 3.2b and 3.6), can't function to its full potential if it is blocked or the water it manages is polluted with solid waste. Effective community scale management of solid waste is, therefore, both a critical sustainability activity and an enabler of enhanced adaptation effectiveness.

At present, formalised waste collection is available in Prey Nob and Kep only on the major roads. This means that, in communities away from the major roads, there is no formalised waste collection at the present time. This largely explains why so much waste ends up in canals and streams. With the awareness raising and capacity building provided under output 1, communities will have increased awareness of the damage caused by solid waste disposal in canals and streams and will be organised to transport waste the short distance required to collection points on the main road.

Activities under Output 1.3. are critical to ensuring that communities have the capacity required to monitor the use of and maintain their infrastructure. Much of the recurring maintenance of the infrastructure will be technically straightforward and will not require specialist labour or equipment.

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<sup>43</sup> UN-Habitat (et al), 2017, Mainstreaming Gender into Adaptation Investments, p.13



This will therefore be most effectively managed by the communities that benefit from the protection and services that the infrastructure provides. To do this, activities under this output will organise communities and provide selected community members with the basic training required to perform basic monitoring and maintenance of the infrastructure. In particular, this relates to the infrastructure investments under the following outputs: 3.1, 3.2a, 3.2b, 3.4a, 3.6, 3.7. The investments are presented in more detail below.

Activities under 1.3 will be implemented in close collaboration with the Communes through the Local Commune Committee (See [Part III, Section A](#) for the management structure). Moreover, the engagement of government at the commune, provincial and national level will make ensure that the government has the ownership of and responsibility for maintenance beyond the life of the project. In the past, some projects, including in the target area, have failed to sufficiently engage both the communitiies and the local and national government, which has resulted in infrastructure falling into disrepair after the period of the project implementation

**Component 2:** Government planning and technical capacity enhanced to sustain and enhance the project’s adaptation benefits

- This is in line with:
  - Adaptation Fund Outcome 2 – Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses

To a lesser extent, this component also addresses

- Outcome 4 – Increased adaptive capacity within relevant development and natural resource sectors
- Outcome 7 – Improved integration of climate-resilience strategies into country development plans

This component is comprised of three outputs:

- 2.1. Government officers at the provincial and district levels trained to plan effectively for sustaining and enhancing the project’s adaptation benefits
- 2.2. Government officers at the provincial and district provided with comprehensive technical training to manage, operate and maintain the infrastructure
- 2.3. Institutional systems strengthened to monitor adaptation investments and replicate their benefits

Activities under Output 2.1 will work with officials involved in sub-national planning and budgeting, particularly from the National Committee for Sub-national Democratic Development (NCDD), Department of Economy and Finance, Department of Planning, Department of Environment and Department of Water Resources and Meteorology. It will focus on how the adaptation infrastructure constructed or repaired under the investment programme in Component 3 can be incorporated into sub-national budgets and new infrastructure can be constructed at the subnational level in the future.

Output 2.2 will increase government technical capacity. This technical capacity will focus on maintenance and management of infrastructure that is beyond the technical capabilities of the community. That said, activities under Output 2.2 should be seen as complementary to activities under Output 1.3. In particular, the technical capacity built will be in support of the infrastructure investments described in Component 3.

As in Component 1, government engagement at all levels is of critical importance. Ensuring that government has the capacity – defined as the ability and willingness – at the commune, provincial and national level to support the continued management and maintenance of the infrastructure is critical to the sustainability of the project.

Finally, activities under Output 2.3 are designed to build institutional capacity. This both distinguishes them from, and makes the complementary to, activities under Output 2.1. Activities under Output 2.1 focus on individual capacity, whereas those under Output 2.3 focus on institutions. To that end, this activity works more closely with the national level through the Project Management Committee and the National Council for Sustainable Development to increase vertical integration and coordination between the sub-national and national levels. This will contribute to ensuring that the adaptation benefits provided by the investments under Component 3 are sustained and can be replicated beyond the two provinces targeted by the project. These activities therefore make a linkage to national level adaptation.

**Component 3:** Resilience built through investment in small-scale protective and basic service infrastructure and natural assets

- This is in line with:
  - Adaptation Fund Outcome 2 – Increase adaptive capacity with relevant development and natural resource sectors,
  - Adaptation Fund Outcome 5 – Increase ecosystem resilience in response to climate change and variability-induced stress,
  - Adaptation Fund Outcome 6 – Diversified and strengthened livelihoods and sources of income for vulnerable people in targeted area.

This component is comprised of eight outputs<sup>44</sup>. Each output is the result of one investment. The investments are summarised here and further detail is presented in [Annex 2](#):

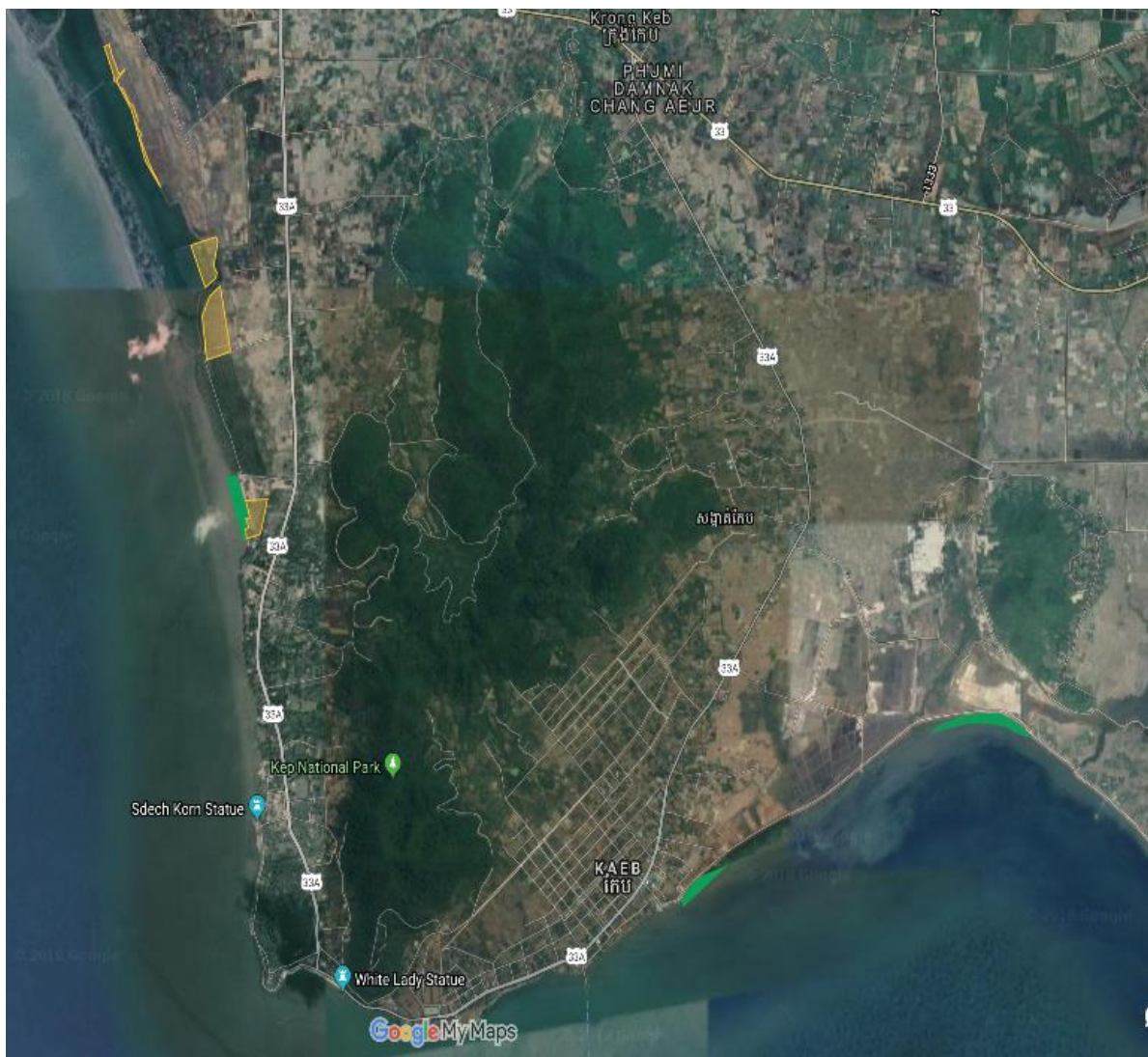
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<sup>44</sup> Note that two of the outputs contain two investments. This is where two separate investments are interdependent; one can't succeed without the other.

## Output 3.1

### 285ha of Mangroves restored in Kep and Angkaol Communes, Kep Province

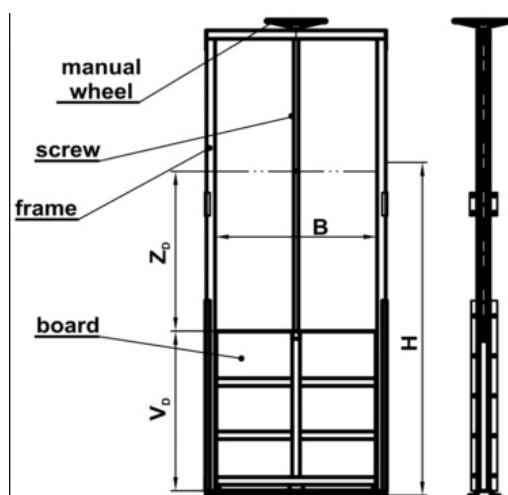
Location	Prey Thom, Kep and Angkaol Communes, Kep
Issues	Coastal land is unprotected, salt water incursion damages water sources and livelihoods
Brief Activities	Planting and protecting mangrove areas
Adaptation Benefits	Land and water sources protected from salt water, increased fish population, Eco-tourism potential
Budget	\$208,704



## Output 3.2

*Water gates repaired in 3 locations in Pong Teuk and Angkaol (a),*

Location	Pong Teuk and Angkaol Communes, Kep
Issues	Water gates are broken leading to ineffective water storage
Brief Activities	Repairing the water gates with climate-resilient designs
Adaptation Benefits	Local people enhance their ability to store and manage water
Budget	\$5,328



## Output 3.2b

### *2 canals rehabilitated in Pong Teuk and Angkaol Communes, Kep Province*

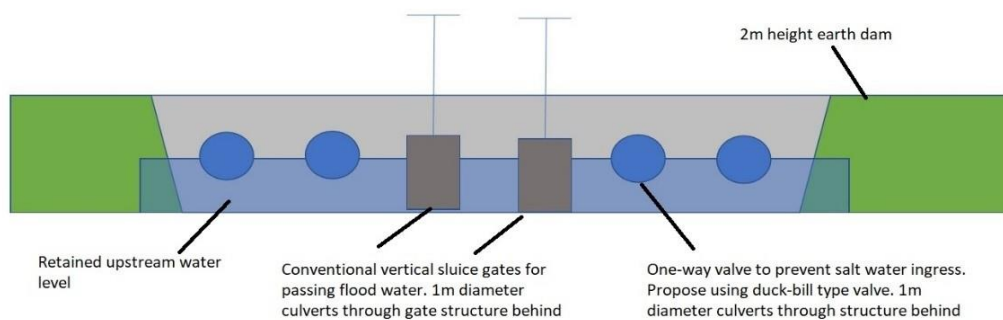
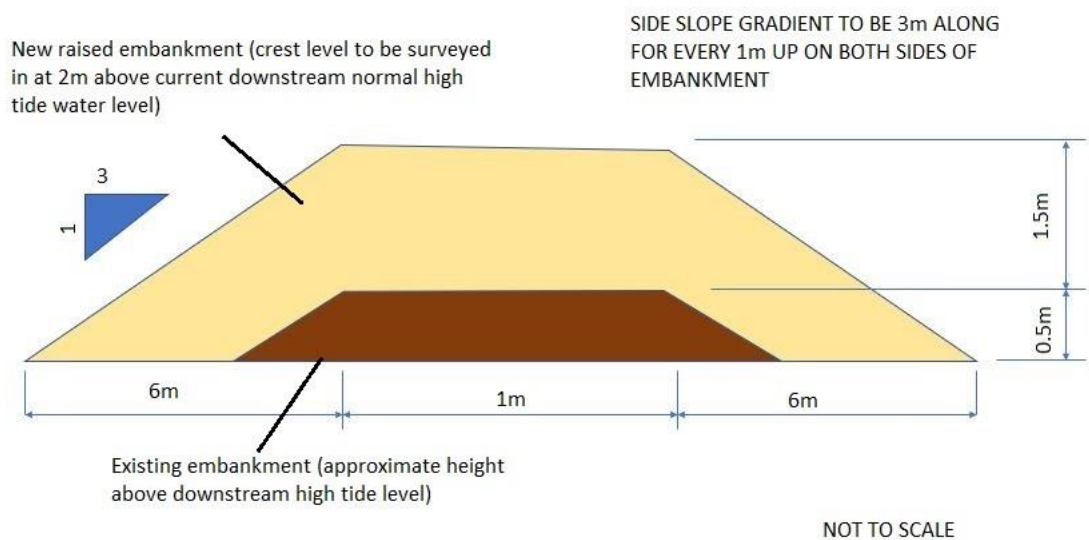
Location	Pong Teuk and Angkaol Communes, Kep
Issues	Canals are overgrown, filled with waste, prone to erosion and unable to effectively store and transport water
Brief Activities	Dredging the canals
Adaptation Benefits	More effective water storage and management
Budget	\$76,050



## Output 3.3

### Prevention of salt water ingress through improved channels

Location	Pong Teuk and Angkaol Communes, Kep
Issues	Sea-level rise and salt water affects rice paddies and in-land water sources
Brief Activities	Fill the embankments and re-design the water gates
Adaptation Benefits	3,500 people benefit from land and water sources that are protected from salt-water incursion and SLR
Budget	\$246,000



## Output 3.4a

***O Thmar Reservoir rehabilitated to increase water storage capability Kep Province***

Location	Pong Teuk Commune, Kep
Issues	O Thmar Reservoir is unable to effectively store and distribute water
Brief Activities	Repairing the water gates with climate-resilient designs, dredging and lining
Adaptation Benefits	All people living in Pong Teuk and Angkaol Communes benefit from increased water storage and distribution in the dry season
Budget	\$660,040



## Output 3.4b

***Bank strengthening work at Roness Reservoir to provide additional water retention and safety***

Location	Pong Teuk Commune, Kep
Issues	Roness Reservoir is unable to effectively store and distribute water, and its embankment is unsafe
Brief Activities	Reinforcing the embankment and detailed technical investigation
Adaptation Benefits	All people living in Pong Teuk and Angkaol Communes benefit from increased water storage and distribution in the dry season
Budget	\$1,304,000





## Output 3.5

### *Resilient Housing designs developed and demonstrations constructed (Both provinces)*

Location	Kep and Prey Nob
Issues	Strong winds frequently damage houses – especially those of the poor
Brief Activities	Piloting designs and training local people on resilient construction techniques
Adaptation Benefits	People can adapt autonomously through improved house construction
Budget	89,000



## Output 3.6

### *Raised embankment and Watergate repair in Ou Ohkna Heng Commune, Prey Nob District, Prey Sihanouk Province*

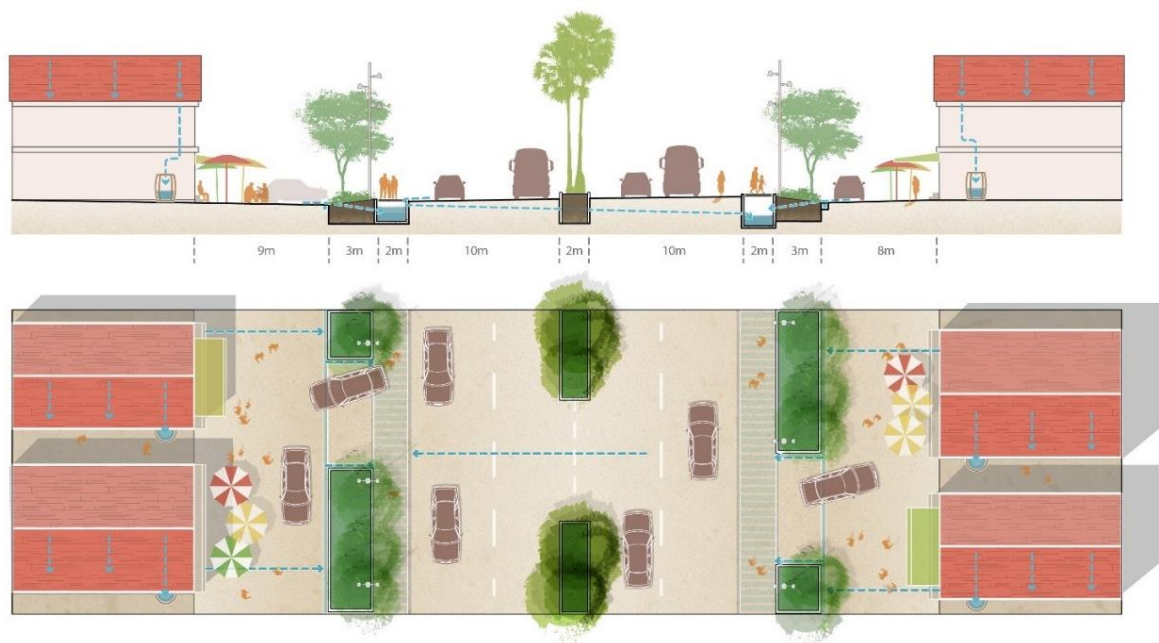
Location	Ou Ohkna Heng Commune, Prey Nob District
Issues	The existing sea-wall has sunk and provides inadequate protection
Brief Activities	Raising the embankment at key points and repairing two water gates
Adaptation Benefits	All people in 3 communes (Approx 20,000 people) benefit from protection from sea water, increased agricultural production and more access to fresh water
Budget	\$266,100



## Output 3.7

### *Drainage and Rainwater Harvesting installed at Veal Rinh Market, Prey Nob District, Prey Sihanouk Province*

Location	Veal Rinh Commune, Prey Nob District
Issues	The market floods when it rains. Run off is polluted, causes local flooding
Brief Activities	Building a storage and draining system, and installing rainwater harvesting
Adaptation Benefits	The market doesn't flood and the downstream water quality is improved. Better water access and livelihoods
Budget	\$712,905

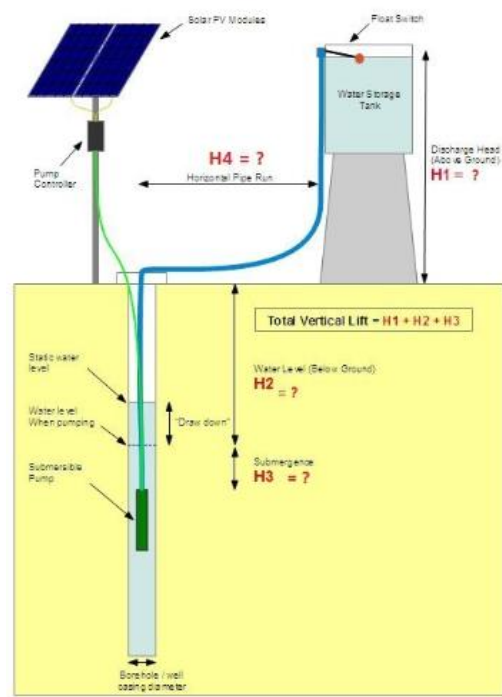


## Output 3.8

### *Tide gauge with early warning system broadcast capabilities installed in Ou Okhna Heng Commune, Prey Nob District, Prey Sihanouk Province*

Location	Ou Okhna Heng and Teuk La'k Communes, Prey Nob District
Issues	Local government and people have inadequate access to weather information and EWS
Brief Activities	Install tide gauge and broadcast facilities
Adaptation Benefits	Local people are equipped with greater information and have more ability to protect their houses and property from severe climate conditions
Budget	\$52,380

Typical Solar Powered Pump System



**Table 5**

*Interventions, costs and beneficiaries of the proposed project*

Concrete Interventions		Target Commune	Estimated Cost (US\$) and Cost-Effectiveness of Direct Beneficiaries (Area Within the Commune)	AF Environmental and Social Principle Triggered
Adaptation to Main Climate Hazards	Investment (For More Detail, Please See <a href="#">Annex 2</a> )			
Adaptation to strong winds	Output 3.5 - Resilient Housing designs developed and demonstrations constructed	All target communes	Total Cost \$89,000. Total beneficiaries 9,720. Cost per beneficiary \$9.12	AF Principle 2,3,4,5,6,13
	Output 3.8  Tide gauge with early warning system Ou Okhna Heng Commune, Prey Nob District	The tide gauge will be located in Ou Okhna Heng Commune	Total cost \$52,380. Total beneficiaries 30,000. Cost per beneficiary \$1.75	AF Principle 2, 3, 6, 12,

Adaptation to droughts	Output 3.2 Water gates repaired in 3 locations in Pong Teuk and Angkaol	2 Communes in Kep Province; Pong Teuk and Angkaol	Total cost: \$5328. Total beneficiaries – 19,553.  \$76,050.	AF Principles 2, 3, 6, 12, 15
	2 canals rehabilitated in Pong Teuk and Angkaol Communes, Kep Province	2 Communes in Kep Province; Pong Teuk and Angkaol	Total \$81,378. 19553 beneficiaries, cost per beneficiary (a+b) \$4.16	
	Output 3.3. Prevention of salt water ingress through improved channels		Total Cost: \$246,000. Total beneficiaries – 3500. \$70.29 per beneficiary	AF Principles 2, 5, 9, 10, 12, 15
	Output 3.4 O Thmar Reservoir rehabilitated to increase water storage capability Kep Province	Located in Pong Teuk, benefitting Pong Teuk and Angkaol Communes	Total Cost: \$660,040. Total beneficiaries – 14,060.  Total Cost: \$1,304,000. Total beneficiaries 24,470  Cost per beneficiary = \$80.26*  (*assumes that there will be a minimum of 24,470 beneficiaries	AF Principles; 2, 5, 6, 10, 12, 15
	3.4b Bank strengthening work at Roness Reservoir to provide additional water retention and safety.			

			between these two investments)	
Adaptation to Sea-level rise and salt water incursion	Output 3.1 285ha of Mangrove planted/restored in Kep	4 Communes in Kep Province (Angkaol, Kep, Prey Thom and Ou Krassar) and 1 in Prey Nob (Prey Nob Commune	Total Cost \$208,704. Total ha 285. Cost per ha \$959. Total Beneficiaries 177,54 Beneficiaries. Cost Per beneficiary = \$11.76	AF Principles 2, 5, 9, 10
	Output 3.6 Raised embankment and Watergate repair in Ou Ohkna Heng Commune, P. Sihanouk Province	The location is in Ou Okhna Heng Commune. Beneficiaries in Ou Oukhna Heng, Boeung Taprom, Prey Nob and Samrong Communes	Total Cost \$266,100. Total Beneficiaries 20,000. Cost Per beneficiary - \$13.31	AF Principles 2, 3, 5, 9, 10, 12,
Adaptation to Floods	Output 3.7 – Drainage and Rainwater Harvesting installed at Veal Rinh Market, Preah Sihanouk Province	Veal Rinh Commune, with Potential secondary benefits to all communes in Prey Nob	Total Cost \$712,905. Total Direct Beneficiaries; 4500, Cost per beneficiary \$158.42. 55,776 Direct and Indirect beneficiaries. Cost per all beneficiaries \$12.81	AF Principles 1, 2, 6, 12

## B. ECONOMIC, SOCIAL AND ENVIRONMENTAL BENEFITS

According to the consultations undertaken in the development of this concept note and full proposal, people face serious economic challenges as a result of salt water incursion, inability to access water and flood and storm damage. The investments listed in [Part II, Section A](#) are designed to bring economic, as well as adaptation benefits. A more detailed analysis and quantification of economic benefits is provided below, in [Part II Section C](#).

Meanwhile, a lack of protective infrastructure and high exposure to storms and coastal flooding means that people regularly lose assets and/or productive capabilities. Damage to houses is common in all 11 of the target communes, while damage to agricultural lands was also frequently highlighted by both local government officials and communities themselves. People often invest their minimal savings into home repairs and reconstruction after being damaged by storms.

The project will bring numerous social benefits. Activities implemented under Component 3 will specifically include women because communities themselves will be in charge of construction and maintenance. This means that instead of using external contractors, the project will hire communities where unskilled labour is required for construction. In this regard, the project can guarantee that 50% of those engaged in the project at the community level will be women. Activities under Output 3.7, which will undertake flood management and rainwater harvesting at Veal Rinh Market are specifically designed to benefit women. The consultations undertaken in the formulation of the proposal estimate that 90% of the vendors in the market are women. This activity will specifically support their adaptation to climate change and make a direct contribution to improving their livelihoods by reducing the number of days on which they are unable to earn.

The project will also bring substantial environmental benefits. By planting 285 hectares of mangrove, the project will provide environmental benefits over and above the adaptation benefits of the mangrove provides. Large, healthy mangrove areas have been shown to benefit fish and crab populations (Kep is famed for its crab fishing) and boost the growth of sea-grass on the near-shore area. By preventing salt water incursion, the mangroves will also support the protection of the land-side environment.

**Table 6**

***Economic, Social and Environmental Benefits***

Type of Benefit	Baseline	With/After Project
<i>Economic</i>	Tourism, which provides employment to over a quarter of Cambodia’s workforce, is threatened by climate change	Areas with significant potential for tourism development will be protected, more resilient and have more robust ecosystems that are necessary to continue to support tourism development and thus greater levels of employment
	Households face damage	Households will not have to invest



	and financial losses as a result of various climate change related hazards, primarily floods and storms	their savings in repairs to their homes
	People's land and productive capacity is damaged by sea-water and/or a lack of fresh water	<p>Target areas will have access to year-round, water, are less likely to have to buy bottled water and increase their productive capacity</p> <p>Flood defences, will contribute to reducing and eliminating loss and damage occurring because of climate change hazards</p>
	Skill levels are low, and employment largely restricted to the agricultural sector	<p>Using the people's process as a means to implement the project's investments will directly contribute to higher incomes and have the co-benefit of improving vocational skill levels, which will enable people to earn higher wages.</p> <p>Improved protective infrastructure will have the co-benefit of protecting agricultural areas and other service infrastructure, which will also benefit livelihoods.</p>
<i>Social</i>	Regular droughts, sea-water incursion, storm damage and floods due to climatic impacts cause, and make worse pre-existing drivers of vulnerability, such as disease, poverty and migration	Improved protective infrastructure will have the co-benefit of protecting agricultural areas and other service infrastructure, which will also benefit livelihoods.
	Poor quality housing and infrastructure in the target areas further drives vulnerability and create additional challenges such as a lack of safety, while facilitating the spread of disease.	Alignment with the commune/district investment plans and increased capacity for officials at those levels to plan for and manage climate resilient investments will ensure that infrastructure and settlements are more resilient in the long term.

	Increasing inequality in Cambodia, including in coastal areas shows that the poorest are not sharing in the proceeds of the country's rapid economic growth	The communities including the poor and vulnerable areas increase capacities and opportunities to gain income from eco-tourism.
<i>Environmental</i>	Severe environmental degradation has taken place throughout the coastal area of Cambodia – especially in areas where there has been investment in infrastructure and tourism	Interventions in mangrove prioritise the environment, while other investments made by the project aim to strengthen the ability of people to live symbiotically with their environment  The soft intervention of improving solid waste and waste water management is designed to rectify a local environmental problem and prevent further damage to the environment from a lack of solid waste management and waste water issues.
	The combined effects of sea-level rise, coastal flooding and on-shore development issues (especially disposal of wastewater) is causing coastal erosion	Better onshore management of water will contribute to reducing coastal erosion effects

## C. COST EFFECTIVENESS

### *Maximising concrete over soft*

The project will maximise the amount of investment in concrete interventions over soft ones. 86% of the project's implementation budget will be directed to the investments proposed under Component 3. Where the project makes investments in soft activities, these will be either a) directly supportive of the concrete investments (i.e. training in installation or operation and maintenance), or b) investments to strengthen commune/district level planning – which will help to sustain and replicate the benefits of the project, and make more effective use of national finance in the future. This approach maximises the adaptation benefits per dollar invested; a greater soft component focus would risk not translating into adaptation benefits, while a greater concrete focus may risk not building sufficient capacity to sustain or replicate them.

## Choosing Cost effective investments

A cost effectiveness and basic cost-benefit analysis has been conducted in the preparation of this proposal, and as a means to select investments that bring economic benefits in addition to their adaptation benefits. The cost per beneficiary figures are presented in [Table 5](#). A more detailed cost effectiveness analysis is presented below in Table 7.

**Table 7**

### Cost Effectiveness and Economic Benefits

Investment (Output)	No of Beneficiaries	Cost Per Beneficiary	Economic Benefit	Logic
Output 3.1	17,754	\$11.65	Increased rice yield and greater fish production: \$96 per household per year according to the conservative scenario or \$400 per household per year according to the more ambitious scenario	Currently most agricultural land yields 2.5 tonnes per hectare and achieves US\$245 per tonne. Conservative scenario assumes 1142 hectares of land will be protected by the mangrove investment and there will be US\$600 benefit in the fishery sector per hectare of additional mangrove <sup>45</sup>
Output 3.2	19,553 (of which 9,526 are paddy farmers)	\$0.27 (a) \$3.89 (b)	Increased yield will generate \$245 per HH per year over the business as usual scenario. The total value of the investment is \$480,200, based purely on increased agricultural yields	Only calculates based on the agricultural families (no economic value assigned to water availability for non-agricultural families)
Output 3.3	3,500	\$70.29	Increased yield will generate \$245 per HH per year over the business as usual scenario. The total value of the investment is \$176,400, based purely on increased agricultural yields	Only calculates based on the agricultural families (no economic value assigned to water availability for non-agricultural families)

<sup>45</sup> Statistics provided by the Fishery Administration, Kep Province

Output 3.4	14,060 (from water), 600 households benefitting from increased production	\$46.94	Those households depending on the reservoir for irrigation will gain \$735 per household relative to a business as usual scenario.	Assumes that the 600ha of agricultural land will benefit from increasing from 1 to 2 rice crops per year at the same yield (2.5 tonnes per hectare). The BAU is that 1 crop per year will decline to 2 tonnes per hectare. The cost of rice is assumed to be constant.
Output 3.5	9720	\$9.16	Each household who benefit from this intervention will save on average \$1,100 each over the next five years from avoiding repairs due to damage	Assumes that there will be a steady increase in the number of homes damaged and destroyed. Assumes that a damaged home costs on average \$500 to repair and a destroyed home costs \$1,500 to re-build (a conservative estimate)
Output 3.6	20,000	\$13.31	Increased yield will generate \$245 per HH per year over the business as usual scenario. The total value of the investment will be \$1,008,230 once complete	Assumes that 4115ha will benefit. Only rice production is calculated. Other adaptation benefits are not estimated.
Output 3.7	4500 (Direct)	\$173	Avoided loss of \$300pp per yr. Total benefit = \$1,350,000  Payback period = 210 days	The analysis conducted by the formulation team found that about 9% of the market's annual income is lost to floods.  The investment will ensure that the market is operational 365 days per year, allowing people to make \$300 per person more, and bringing a total benefit of \$1,350,000

### ***Cost effective implementation***

UN-Habitat will ensure that the unskilled labour required to construct the investments described in [Part II Section A](#) will use the [People's Process](#). This implementation approach has been shown to reduce implementation costs by 20-30 per cent over the life of the project by using community labour instead of external contractors, and by procuring local materials where they are available. The

alternative implementation model to the People’s Process is to use external contractors, which, as highlighted above, is more expensive and less likely to foster local ownership.

Table 7, above, demonstrates the cost-effectiveness logic of the selection of investments to be implemented under the project. This shows that the benefits provided, especially in terms of improved livelihood was a key consideration in the selection of investments that would be carried forward to the proposal.

The procurement of all materials required according to the investments in Outputs 3.1 to 3.8 of the project will be conducted according to Ministry of Economy and Finance guidelines to ensure that equipment is procured transparently and at the lowest possible cost. Re-evaluating the actions proposed under this project through a comprehensive vulnerability assessment and action planning process also ensures that investments are the most appropriate, with the greatest adaptation benefits, which also ensures their cost-effectiveness.

**Table 8**

*Brief cost and alternatives analysis of proposed adaptation options.*

Proposed Action	Cost Effectiveness Criteria		Alternative Action	Cost Effectiveness Criteria	
3.1 285ha of Mangroves restored in Kep City and Angkaol Communes, Kep Province	Future cost of climate change	✓	Building sea-walls	Future cost of climate change	✗
	Project efficiency	✓		Project efficiency	✗
	Community involvement	✓		Community involvement	✗
	Cost/feasibility	✓		Cost/feasibility	✗
	Environmental and social safeguarding risks	Less risk		Environmental and social safeguarding risks	More risk
3.2a Water gates repaired in 3 locations in Pong Teuk and Angkaol 3.2b 2 canals rehabilitated in Pong Teuk and Angkaol Communes, Kep Province	Future cost of climate change	✓	New water treatment plant	Future cost of climate change	✗
	Project efficiency	✓		Project efficiency	✗
	Community involvement	✓		Community involvement	✗
	Cost/feasibility	✓		Cost/feasibility	✗
	Environmental and social safeguarding risks	Less risk		Environmental and social safeguarding risks	✓
3.3 Prevention of salt water ingress	Future cost of climate change	✓	Building a sea wall	Future cost of climate change	✓
	Project efficiency	✓		Project efficiency	✗

through improved channels	Community involvement	✓		Community involvement	✘
	Cost/feasibility	✓		Cost/feasibility	✘
	Environmental and social safeguarding risks	Less risk		Environmental and social safeguarding risks	More risk
3.4a O Thmar Reservoir rehabilitated to increase water storage capability Kep Province	Future cost of climate change	✓	New reservoir	Future cost of climate change	✓
	Project efficiency	✓		Project efficiency	✘
	Community involvement	✓		Community involvement	✘
	Cost/feasibility	✓		Cost/feasibility	✘
3.4b Bank strengthening work at Roness Reservoir to provide additional water retention and safety.	Environmental and social safeguarding risks	✓		Environmental and social safeguarding risks	✘
3.5 Resilient Housing designs developed and demonstrations constructed (both provinces)	Future cost of climate change	✓	Relocation	Future cost of climate change	✘
	Project efficiency	✓		Project efficiency	✘
	Community involvement	✓		Community involvement	✘
	Cost/feasibility	✓		Cost/feasibility	✘
	Environmental and social safeguarding risks	Less risk		Environmental and social safeguarding risks	Greater risk
3.6 Raised embankment and Watergate repair in Ou Ohkna Heng Commune, P. Sihanouk Province	Future cost of climate change	✓	Building sea walls	Future cost of climate change	✓
	Project efficiency	✓		Project efficiency	✘
	Community involvement	✓		Community involvement	✘
	Cost/feasibility	~		Cost/feasibility	✘
	Environmental and social safeguarding risks	Less risk		Environmental and social safeguarding risks	More risk
3.7 Drainage and Rainwater Harvesting	Future cost of climate change	✓	Relocating the market/constructing a new market	Future cost of climate change	✓
	Project efficiency	✓		Project efficiency	✘

installed at Veal Rinh Market, P. Sihanouk Province	Community involvement	✓		Community involvement	✘
	Cost/feasibility	✓		Cost/feasibility	✘
	Environmental and social safeguarding risks	Less risk		Environmental and social safeguarding risks	More risk
3.8 Tide gauge with early warning system broadcast capabilities installed Tide Gauge in Ou Okhna Heng Commune, Prey Nob District	Future cost of climate change	✓	Taking no Action	Future cost of climate change	✘
	Project efficiency	✓		Project efficiency	✘
	Community involvement	✓		Community involvement	✘
	Cost/feasibility	✓		Cost/feasibility	✘
	Environmental and social safeguarding risks	Less risk		Environmental and social safeguarding risks	Greater risk

## D. CONSISTENCY WITH NATIONAL OR SUB-NATIONAL STRATEGIES

The project has been designed to align with national and sub-national development policies, strategies and plans on development, climate change and disaster resilience and decentralization reform.

As Goal 13 of the Sustainable Development Goals and Article 1-5 of the Paris Agreement on Climate Change<sup>46</sup> indicate, global society is committed to adapt to climate change and reduce its impact. In support of this aspiration, the Royal Government of Cambodia also adopted several policies and strategies to reduce the impact of climate change by enhancing the adaptive capacity and resilience of climate change, such as the Cambodia Climate Change Strategic Plan (CCCSP) (2014-2023), the Climate Change Action Plan (CCAP), and the Nationally Determined Contribution (NDC). To align with these global and national climate goals and plans, the proposed project aims to enhance climate change adaptation and resilience of the most vulnerable coastal human settlements of Cambodia through concrete adaptation actions, particularly in areas where eco-tourism has the potential to sustain such interventions.

The Rectangular Strategy for Growth, Employment, Equity and Efficiency: Building the Foundation Toward Realizing the Cambodia Vision 2050. The Rectangular Strategy outlines prioritised policies in its Rectangular Strategy Phase IV (See Figure 11). This strategy puts acceleration of governance reform at its core, along with contributing elements: i) Human Resource Development, ii) Private Sector and Job Development, iii) Inclusive and Sustainable Development, and iv) Economic Diversification.

The Cambodian government has also set environmental sustainability as one of their prioritized actions. Actions on environmental sustainability include reducing the impact of climate change by enhancing the adaptive capacity and resilience to climate change, particularly through the implementing the Cambodia Climate Change Strategic Plan (CCCSP) (2014-2023).

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<sup>46</sup> Cambodia entered the Paris Agreement on Climate Change into force on 18th of March 2017. See. [http://unfccc.int/paris\\_agreement/items/9444.php](http://unfccc.int/paris_agreement/items/9444.php)



## Diagram of Rectangular Strategy - Phase IV

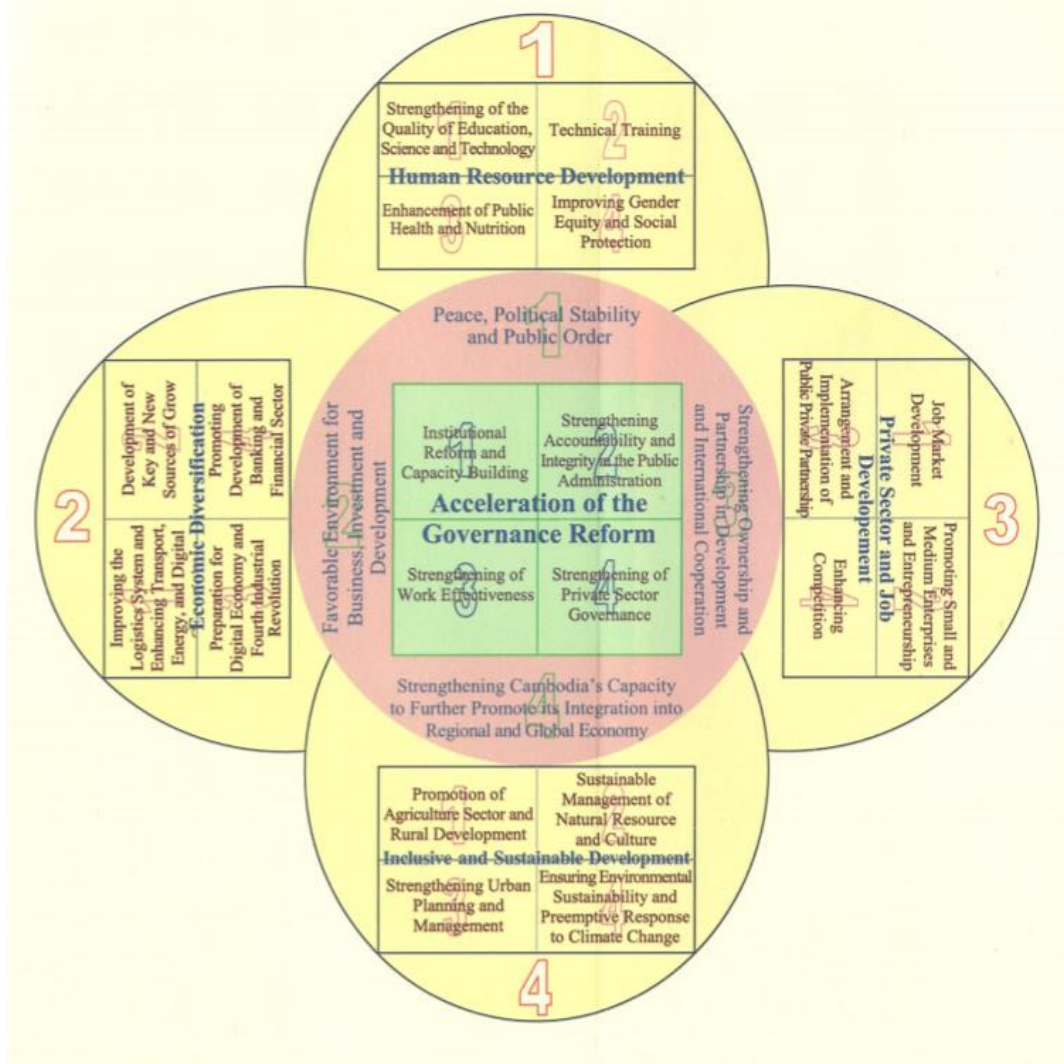


Figure 11 “The Rectangular Strategy Phase IV.”

The CCCSP details Cambodia’s strategic response to climate change, and forms the basis of the Nationally Determined Contribution. It will be implemented, in the initial stage, through the Climate Change Action Plan (CCAP). The CCCSP’s vision is to develop “towards a green, low-carbon, climate-resilient, equitable, sustainable and knowledge-based society”. To achieve its vision, Royal Government of Cambodia (RGC) sets eight strategic objectives. Among the eight strategic objectives, this project aligns with strategic objectives (SO) 2, 3, 5, and 7. Strategic Objective 2 aims to reduce sectoral, regional, gender vulnerability and health risks to climate change impacts through existing and new vulnerability and risk assessments (strategy a). It also aims to improve coastal zones and protected areas (strategy g). Strategic Objective 3 pursues climate resilience of specific locations including protected areas. Encouraging eco-tourism is highlighted as one of the most cost-effective approaches for addressing climate change (strategy b). Strategic Objective 5 aims to improve

capacities, knowledge and awareness on climate change responses through trainings, while Strategic Objective 7 targets strength of “institutions and coordination frameworks for national climate change responses” through mainstreaming climate change into national and sub-national development plans (strategy a).

The overarching CCAP was finalized in 2016 to guide the initial phase of implementation of the CCCSP, with 17 initial actions identified by the Ministry of Environment. Action 2 of the CCAP is to implement national and sectoral climate change vulnerable assessment. Testing specific management options to handle climate change is also included in Action 3. Action 11 aims to promote and improve the adaptive capacity of communities to respond to climate change. Finally, Action 13 is capacity building of national institutions coordinating the implementation of climate change response. These actions (2, 3, 11 and 13) are addressed by this project.

There are 15 sector CCAPs as of 2018. In many cases, the first phases of these expire in 2018 and updates are currently being developed. However, this project is in line with the Climate Change Action Plan for Water Resources and Meteorology, for example, which prioritises, *inter alia*, reservoirs, dams and weirs, and river bank and coastal areas<sup>47</sup>. All the sector CCAPs can be found [here](#).

The Nationally Determined Contribution (NDC) refers back to the CCCSP as the means of implementation of Cambodia’s goals. The NDC identifies that national vulnerability to climate change is caused not only by geography and high reliance on agriculture sector but also by lack of financial, technical, and human capacities. Infrastructure and coastal zones are recognized as one of most vulnerable sectors by climate change. The NDC also raises the profile of increased adaptive capacity to address climate change as a priority.<sup>48</sup> Cambodia has therefore selected a number of ‘priority actions’, giving prominence to ones with climate change impact mitigation co-benefits. The project address the following priorities through its components as follows:

**Table 9**

***Aligning NDC Priorities with Proposed Project Components***

NDC – Priority Actions	Project Component/Output
Promoting and improving the adaptive capacity of communities, especially through community-based adaptation actions.	Component 1, Outputs 1.1, 1.2 and 1.3 and Output 3.5 will lead to strengthened community capacity.  All investments implemented by the project under Component 3 will be locally-driven.
Restoring the natural ecology system to respond to climate change.	Component 3, Output 3.1 will restore 285 hectares of mangrove along Kep’s coastline that will strengthen the ability of the coastal ecological system to respond to climate change, as well as provide co-benefits such as defending agricultural land near the coast and increasing fish and crab populations.

<sup>47</sup> MoWRAM (2014) Climate Change Action Plan for Water Resources and Meteorology, pp3-4

<sup>48</sup> Cambodia’s NDC to the UNFCCC, p.4

Implementing management measures for protected areas to adapt to climate change.	Component 2, Output 2.3 will strengthen the institutional capacity to manage the investments, including the green investment in mangrove described above and in Output 3.1.
Strengthening early warning systems and climate information dissemination.	Component 3, Output 3.8, Tide gauge with early warning system broadcast capabilities to be installed will contribute towards enhanced early warning capabilities.
Developing and rehabilitating the flood protection dykes for agricultural and urban development.	Component 3, Outputs 3.3 and 3.6 will improve embankments that will benefit a combined 23,500 people.

In addition to its comprehensive development and climate change policy framework, the Cambodian government has placed significant emphasis on decentralization and deconcentration (D&D) reform, which promotes transformation of responsibilities and functions of government from national level to sub-national level. In Cambodia’s NSDP, the government aims at the “[p]rovision of power and duties to manage and perform all respective functions in line with the principles of local autonomy and local accountability to the maximum level”. In accordance with this focus on D&D, the project will be executed through an Agreement of Cooperation with the NCSO, who will work with the Provincial Halls of Kep and Preah Sihanouk Provinces. Further details are provided in [Part III, Section A](#).

In terms of plans at the sub-national level, 6 cities, including Kep and Sihanoukville, are starting to work with the Global Green Growth Institute (GGGI) to develop green city strategic plans, under the framework of the emerging national strategic plan for green secondary cities. The project will coordinate with GGGI to ensure the alignment of this initiative with the proposed project.

The table below summarises how the project aligns with policies, strategies and plans of the Cambodian government. The main objective of the project is to enhance climate change adaptation and resilience of the most vulnerable coastal human settlements of Cambodia through concrete adaptation actions, particularly in areas where eco-tourism has the potential to sustain such interventions.

**Table 10**

*Project alignment with government priorities*

	NSDP (2014-2018)	CCCSP (2014-2023)	NDC	CCAP	THE ORGANIC LAW	IP3-III (2018-2020)	The National Strategic Plan For Green Secondary
Community-scale knowledge and capacity enhanced to sustain the adaptation benefits of the project's investments		X	X	X			X
Government planning and technical capacity enhanced to sustain and enhance the project's adaptation benefits	X		X		X	X	
Resilience built through investment in small-scale protective and basic service infrastructure and natural assets	X		X	X			

## E. COMPLIANCE WITH RELEVANT NATIONAL TECHNICAL STANDARDS AND THE ENVIRONMENTAL AND SOCIAL POLICY OF THE ADAPTATION FUND

**Table 11**

*Compliance with National Technical Standards*

Expected Concrete Output/Intervention	Relevant Rules, Regulations, Standards and Procedures	Compliance, Procedure and Authorizing Offices	AF ESP Principles at Risk, if National Technical Standards are Not Applied.	Mitigation of Risk
Output 1.1 Community capacity built to collect and manage solid waste	Sub-decree on Urban Solid Waste Management (2015)  Sub-decree on Plastics bags Management (2017)	As there is no national technical standard defining capacity building at the community level	Principle 2, 3, and 5	All principles will be taken into account when developing vulnerability assessment and action planning
Output 1.2. Communities in target areas have been trained on resilient house construction techniques	National housing policy (2014)  Anukret # 86 on Construction Permit	The Provincial Halls of Kep ad Preah Sihanouk Provinces will work with the respective Provincial Departments of Provincial and Municipal Administration	As above	
Output 1.3. Communities have been organised to	The Organic Law (2001)	The Provincial Halls of each province will be responsible for	No risk	

manage, monitor and maintain the infrastructure investments under Component	Commune planning and investment project guidelines for infrastructure projects  Guidelines for Commune Development Plans and Investment Plans (NCDD)	overseeing alignment with commune development planning. Both the Provincial Halls and the National Committee for Sub-National Democratic Development are under the Ministry of Interior		
Output 2.1. Government officers at the provincial and districts/cities trained to plan effectively for sustaining and enhancing the project's adaptation benefits	Guidelines for Integrating Climate Change into Commune Development Planning (MoE/CCCA)	MoE will take a lead to ensure that the guidelines are followed	No Risk	
Output 2.2 Government officers at the provincial and district provided with comprehensive technical training to manage, operate and maintain the infrastructure	Guidelines on provincial/district/commune project operations  Other relevant guidelines are identified in Outputs 3.1 to 3.8, below	MoE and the Provincial Halls will work together to ensure compliance	No Risk	

Output 2.3. Institutional systems strengthened to monitor adaptation investments and replicate their benefits	Commune planning and investment project guidelines for infrastructure projects Guidelines for Integrating Climate Change into Commune Development Planning (MoE/CCCA)  Close alignment with IP3-III	MoE and the Provincial Halls will work together to ensure compliance	No Risk	
Output 3.1. 285ha of Mangroves restored in Kep City and Angkaol Communes, Kep Province	Law on environmental protection and natural resources management (1996)  National Strategic Plan on Green Development 2013-2030	For all outputs 3.1 – 3.8, the Provincial Halls of the two respective provinces will be responsible for ensuring the construction/maintenance is implemented in accordance with national laws and technical standards. The respective provincial departments that will engage in the investments are listed below - Kep Province		AF Principles 2, 5, 9, 10
Output 3.2	Law on Water Resource Management Article 5-11 (also applies to	Department of Water Resources and		AF Principles 2, 3, 6, 12, 15

Water gates repaired in 3 locations in Pong Teuk and Angkaol	outputs 3.2b, 3.3, 3.4, 3.6)	Meteorology - Kep Province		
2 canals rehabilitated in Pong Teuk and Angkaol Communes, Kep Province				
Output 3.3 Prevention of salt water ingress through improved channels	Technical Guidelines for Commune/Sangkat (2009). Fund's projects which consist of 3 parts (Part 1: Assessment and designs; Part 2: Technical designed standard, construction, equipment /materials and works; Part 3: Monitoring and Evaluation) (2009)	Department of Water Resources and Meteorology - Kep Province		AF Principles 2, 3, 6, 12, 15
	Law on Water Resource Management Article 5-11			
Output 3.4 O Thmar Reservoir rehabilitated to increase water storage capability Kep Province	Law on Water Resource Management Article 5-11  Drinking Water Quality Standards (Ministry of	Department of Water Resources and Meteorology - Kep Province		AF Principles; 2, 5, 6, 10, 12, 15



	Industry, Mines and Energy)			
Output 3.5 Resilient Housing designs developed and demonstrations constructed (both provinces)	National Housing Policy (to provide general people, especially low and medium income households and vulnerable groups with access to decent housing or improving a house to ensure the right to adequate housing)	Department of Land Management, Urban Planning and Construction - Preah Sihanouk Province and Kep Province		AF Principle 2,3,4,5,6,13
Output 3.6 Raised embankment and Watergate repair in Ou Ohkna Heng Commune, P. Sihanouk Province	Law on Water Resource Management Article 5-11	Department of Water Resources and Meteorology - Preah Sihanouk Province		AF Principles 2, 3, 5, 9, 10, 12,
Output 3.7 Drainage and Rainwater Harvesting installed at Veal Rinh Market, P. Sihanouk Province	Anukret # 86 on Construction Permit	Department of Land Management, Urban Planning and Construction - Preah Sihanouk Province		AF Principles 1, 2, 6, 12,
Output 3.8 Tide gauge with early warning system broadcast capabilities installed (Tide Gauge in Ou Okhna Heng Commune, Prey Nob District	Not relevant	Department of Water Resources and Meteorology – Preah Sihanouk Province	No risk	AF Principle 2, 3, 6, 12,

Ensuring effective and successful compliance with National Technical Standards is a vital component of ensuring effective implementation of environmental and social safeguard measures. National technical standards do not give the project all the tools to comply with the Adaptation Fund's Environmental and Social Policy, or UN-Habitat's Environmental and Social Safeguard system. As such, additional safeguarding measures are outlined in Section K, below. These safeguarding measures, outlined in Section K, will complement the national technical standards, where they exist, and augment them where they do not.

Please note that the hierarchy of laws from national to local level in Cambodia is as follows: The Constitution of the Kingdom of Cambodia (the "Constitution") is the supreme law in Cambodia. All laws, legal documents and state body decisions must adhere to it. Laws are adopted by the National Assembly, the Senate and promulgated by the King. A sub-decree ('Anukret') is used to clarify provisions within existing laws, set out the functions and duties of Royal Government of Cambodia bodies and appoint senior government officials. It is drafted by relevant ministries, approved by the Council of Ministers and endorsed by the Prime Minister. It is the most common governmental decision and is applicable in the above table. Ministerial Orders or Proclamations (Prakas) are executive regulations made at the ministerial level to implement and clarify specific provisions within higher-level legislative documents and give instructions. Their scope is limited to the focus and subject matter of the ministry that enacted them.

At the sub-national level, local Regulations or by-laws ('Decas') are approved by Commune Councils at sub-national level. They have force of law within the territorial authority of the Commune Councils, thereby cannot conflict with other regulations at the national level.

## F. DUPLICATION WITH OTHER FUNDING SOURCES

The sites selected for this project were chosen because of their high vulnerability and inability to adapt to climate change, as well as because the Royal Government of Cambodia has identified the coastal zone as a priority area. However, the target sites are also characterised by minimal other work by development partners in climate change (other donor initiatives were discussed during national and local consultations and are summarised in [Part II Section H](#), below).

Nevertheless, projects have been identified through the consultation mission and through institutional knowledge of UN-Habitat, thanks to its long history of operations in Cambodia. Table 12 below summarises other relevant projects that are either ongoing, recently completed, or about to start in Cambodia. Historical projects are not included.

**Table 12**

### *Relevant Projects/Programmes in the Target Area*

Relevant Projects/ Programme	Lessons Learned	Complimentary Potential	Project Timeline and Budget
Vulnerability Assessment and Adaptation Programme for Climate Change in the Coastal Zone of Cambodia Considering Livelihood Improvement and Ecosystems, implemented by UNEP, executed by Ministry of Environment, funded by GEF-LDCF.	There is a feeling from a number of stakeholders that this VA is insufficient for planning of local investments for adaptation.	The current project has utilised findings of the vulnerability assessment carried out by the UNEP project in Prey Nob district (this is the only overlapping target district) in its formulation	\$1.6 million, 2012-2015
Building climate resilience of urban systems through Ecosystem-based Adaptation (EbA) in the Asia-Pacific region, implemented by UNEP, executed by Ministry of Environment, funded by LDCF.	The UNEP EbA project has not yet started, and will likely begin implementation sometime in 2018. It is proposed to keep a 'green/brown complementarity' between these two projects.	UN-Habitat is an implementing partner on the UNEP project, which enables it to ensure complementarity potential.	To begin in 2018. \$1.5 million (Cambodia component).
"Strengthening Climate Information and Early Warning Systems to	The UNDP project does not work in the same target areas as this project. The UN-Habitat concept	While MoWRAM is the main stakeholder at the national level	\$4.9 million, 2014-2017.

Support Climate-Resilient Development in Cambodia”, implemented by UNDP, executed by Ministry of Water Resources and Meteorology, funded by GEF-LDCF.	note formulation mission met UNDP to discuss this project (section H).	the project works with NCDD at the national level. NCDD and MoWRAM will sit on this project’s steering committee	
Reducing the Vulnerability of Cambodian Rural Livelihoods through Enhanced sub-national Climate Change Planning and Execution of Priority Actions, implemented by UNDP, executed by Ministry of Environment and Ministry of Planning, funded by GEF-LDC	As above.	The project works with NCDD at the national level. NCDD will sit on this project’s steering committee	\$4.5 million, 2017-2019.
Pilot Programme for Climate Resilience (PPCR), Implemented and funded by ADB, executed by Ministries of Environment, Rural Development and Planning.	The implementation/infrastructure component of PPCR doesn’t overlap target areas with the proposed project.	UN-Habitat is a partner in a small component of PPCR, so is well placed to coordinate lessons learned at the national level.	\$85 million, 2009-2019.
Cambodia Climate Change Alliance, implemented by UNDP, executed by Ministry of Environment and funded by the EU, SIDA and DANIDA.  Green Secondary City Planning, implemented by GGGI.	The UN-Habitat concept note formulation mission met with the CCCA programme and agreed full information sharing (see Section H, below).  This project will be implemented in Kep and Sihanoukville. GGGI will be a non-resource partner in this project, and will also take an observer position on the board, to ensure coordination.	The proposed project will invite a representative of the CCCA programme to be on the management board, as CCCA is the largest project that supports NSCD in its coordination of all climate change related projects in Cambodia.  The actions taken in this project will be shared with GGGI, who will incorporate	\$>20 million, 2010-2019  Unknown, 2015-2019

		their lessons learned in the overall city plans for Kep and Sihanoukville.	
Fishery Conservation and Mangrove Protection in Preah Sihanouk and Kep Provinces, implemented by the International Union for the Conservation of Nature (IUCN).	IUCN is currently working with MoE to establish a protected karst landscape in Kampot Province and its first marine protected area around the Koh Rong Archipelago.	IUCN partners with the Ministry of Environment in May 2017, through a memorandum of understanding, providing complementarity potential.	2016 to
Partnerships for Environmental Management in the Seas of Southeast Asia, an intergovernmental organization operating in East Asia to foster and sustain healthy and resilient oceans, coasts, communities and economies across the region.	The activities have focused on a different area of Preah Sihanouk city than this project, as well as water use and supply management in Stung Hav District, which neighbours the target district of this project. PEMSEA has also established protection and management of 1,060 hectares of mangrove areas, including in Prey Nob District.	UN-Habitat has worked with PEMSEA previously, including during the Sihanoukville climate change vulnerability assessment work undertaken in 2011, and has good relationships with the organisation and its work.	2006 to ongoing
Mangrove planting in Fishery Communities – implemented by the Fisheries Action Coalition Team (FACT).	FACT is implementing small-scale mangrove works in Prey Nob district.	The work is small scale and limited to mangrove, however, FACT has lengthy experience which the project can draw upon.	2016 to Ongoing
Marine Protected Area related activities on Koh Rong island (Implemented by a coalition of NGOs, including Fauna and Flora International, CARE, SONGSA Foundation and IUCN.	The Marine Protected Area was established by Government Declaration No. 364 dated 16 June 2016.	The experience of implementing these projects will inform activities implemented in Koh Rong. However, this project does not directly work on strengthening the marine protected area around Koh Rong, and therefore there is no direct overlap.	2016 to Ongoing
Small scale NGO Actions in the Tumnuol Rolok area.	Three small NGOs: Peur un Sourire d’Enfant (PSE), Operation Enfant du Cambodia	These projects are small scale and primarily relate to	Ongoing

(OEC) and M'lob Tapang have small scale education programmes in the area.

education, thus no direct linkage exists.

## G. LEARNING AND KNOWLEDGE MANAGEMENT

Components 1&2 of the project address knowledge management and sustainability. Activities under this component are designed to increase community and local government capabilities to manage solid waste, resilient housing (at the community scale) and planning and maintenance capacity at the institutional level.

The participatory approach to implementation will promote building knowledge at the local level, including on planning (at local government level) and on technical/vocational skills for constructing and maintaining small-scale resilient infrastructure (both at local government and community level). There will be direct and ongoing sharing of lessons from the project implementation sites, while the project will also use a participatory monitoring process, which will enable the beneficiary communities under Component 3 to work directly with the project's monitoring and evaluation officer, to highlight issues in delivery and to strengthen adaptation benefits, including in replication and sustaining the project's gains.

At the national level, other vulnerable districts and communes will be able to derive lessons learned from the project. Information will be consolidated in reports and the project investment will support the development or refinement of tools and guidelines will be for developing resilient infrastructure<sup>49</sup>. The project will be executed through the Ministry of Environment/National Committee for Sustainable Development and the two Provincial Halls, however, this structure will be supported by forging links with other relevant government bodies, particularly the NCDD at the national level and the Provincial Departments of Water Resources and Meteorology and Land Management, Urban Planning and Construction in both provinces.

As part of the sustainability/exit strategy, the project will develop participatory monitoring processes, which will trigger institutional learning processes, participation, knowledge exchange and replication and scale-up of good practices.

UN-Habitat is part of a number of international dissemination mechanisms. The Knowledge Centre on Cities and Climate Change (in short: K4C) provides a knowledge management platform for Climate Change and Human Settlements interventions. It is proposed to use this platform (as well as the UN-Habitat website) to disseminate the lessons learned from this project. UN-Habitat will also work to integrate knowledge generated from the project with the knowledge management component of the CCCA programme, and through the 'camclimate' [website](#)<sup>50</sup>. The agency is also coordinating the UN System representation on human settlements at the Conference of the Parties (CoPs).

<sup>49</sup> See for example the Climate Resilient Irrigation Guidance Paper, 2013 - [http://webcache.googleusercontent.com/search?q=cache:WOyCVifS69IJ:www.unepdhi.org/-/media/microsite\\_unepdhi/publications/documents/unep\\_dhi/carp-resilient%2520irrigation-final%2520ud.pdf%3Fla%3Den+&cd=1&hl=en&ct=clnk&gl=th](http://webcache.googleusercontent.com/search?q=cache:WOyCVifS69IJ:www.unepdhi.org/-/media/microsite_unepdhi/publications/documents/unep_dhi/carp-resilient%2520irrigation-final%2520ud.pdf%3Fla%3Den+&cd=1&hl=en&ct=clnk&gl=th)  
<sup>50</sup> <http://www.camclimate.org.kh>

To ensure lessons and experiences of the project can reach target audiences at the local, national and international levels, a communication plan will be established in the inception phase of the project. This will create a larger vision of which stakeholders the project will reach and how and through which channel(s) to reach them. For example, local people can be effectively reached through leaflets and local radio, which is popular in Cambodia, while social media can reach more broadly citizens all over Cambodia, in addition to printed media (articles in national and local newspapers), non-printed medias (television, national radio). The use of social media would be particularly relevant to reach the youth population (aged 15-24), which represents 20.6% of the total population of Cambodia.<sup>51</sup>

**Table 13**

*Learning and knowledge management*

Expected Concrete Outputs	Learning Objectives (Lo) & Indicators (I)	Knowledge Products
<p><b>Output 1.1.</b> Community capacity built to collect and manage solid waste</p> <p><b>Output 1.2.</b> Communities in target areas have been trained on resilient house construction techniques</p> <p><b>Output 1.3.</b> Communities have been organised to manage, monitor and maintain the infrastructure investments under Component 3</p>	<p>LO – Community members trained to have the knowledge on organising community scale solid waste collection, resilient house construction and on the organisation required to manage the assets constructed under the outputs of Component 3.</p> <p>i Number of community level management committees/structures established and no. of community members trained</p>	<p>Community level training materials</p>
<p><b>Output 2.1.</b> Government officers at the provincial and districts/cities trained to plan effectively for sustaining and enhancing the project’s adaptation benefits</p> <p><b>Output 2.2.</b> Government officers at the provincial and district provided with comprehensive technical</p>	<p>LO – provincial governments, commune officials and communities themselves gain knowledge of how to plan for, construct, manage and maintain infrastructure, resilient houses and natural assets that will make them</p>	<p>A set of guidelines produced that covers step-by-step the process of designing, planning, monitoring and managing small scale infrastructure and protective natural assets for resilience.</p>

<sup>51</sup>[http://cambodia.unfpa.org/sites/default/files/pub-pdf/Flyer\\_Cambodia\\_Youth\\_Factsheet\\_final\\_draft\\_%28approved%29.pdf](http://cambodia.unfpa.org/sites/default/files/pub-pdf/Flyer_Cambodia_Youth_Factsheet_final_draft_%28approved%29.pdf)

<p>training to manage, operate and maintain the infrastructure</p> <p><b>Output 2.3.</b> Institutional systems strengthened to monitor adaptation investments and replicate their benefits</p>	<p>more resilient to climate change</p> <p>i – Number of officials trained</p>	<p>Training materials under each output (books, slides etc).</p>
<p><b>Output 3.1.</b> 285ha of Mangroves restored in Kep City and Angkaol Communes, Kep Province</p> <p><b>Output 3.2</b></p> <p>(a) Water gates repaired in 3 locations in Pong Teuk and Angkaol</p> <p>(b) 2 canals rehabilitated in Pong Teuk and Angkaol Communes, Kep Province</p> <p><b>Output 3.3</b> Prevention of salt water ingress through improved channels</p> <p><b>Output 3.4</b></p> <p>(a) O Thmar Reservoir rehabilitated to increase water storage capability Kep Province</p> <p>(b) Bank strengthening work at Roness Reservoir to provide additional water retention and safety.</p> <p><b>Output 3.5</b> Resilient Housing designs developed and demonstrations constructed (both provinces)</p> <p><b>Output 3.6</b> Raised embankment and Watergate repair in Ou Ohkna Heng Commune, P. Sihanouk Province.</p>	<p>Lo – Provincial and commune officials and communities will have enhanced knowledge of operating infrastructure and protective natural and social assets to enhance resilience.</p> <p>i – Number and types of infrastructure constructed and protective natural/social assets built/rehabilitated.</p>	<p>Documentation of good practices, effective designs and lessons learned.</p>

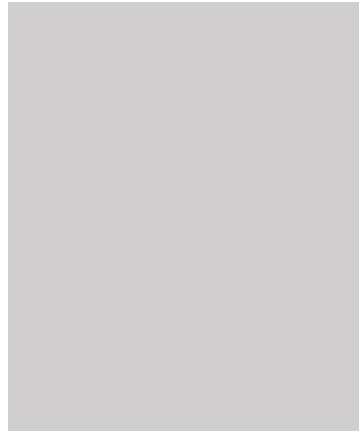
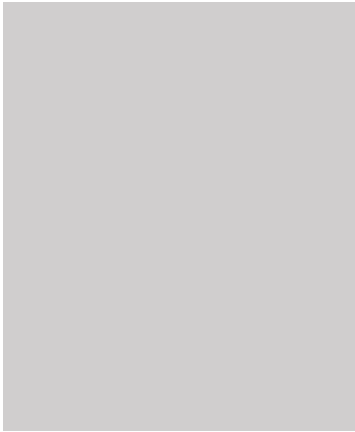


**Output 3.7**

Drainage and Rainwater Harvesting installed at Veal Rinh Market, P. Sihanouk Province

**Output 3.8**

Tide gauge with early warning system broadcast capabilities installed. Tide Gauge in Ou Okhna Heng Commune, Prey Nob District.



## H. CONSULTATIVE PROCESS

In development of this project, UN-Habitat undertook several joint missions by the country office representatives of the Regional Office for Asia and the Pacific to consult national and local stakeholders from 8<sup>th</sup> to 12<sup>th</sup> of May 3<sup>rd</sup> to 7<sup>th</sup> July and 11<sup>th</sup> to 16<sup>th</sup> of December 2017. UN-Habitat also mobilised seven engineers and associated experts from [Arcadis](#), under the auspices of the [Shelter Programme](#), to undertake further technical design work on the investments outlined in Component 3 between 15<sup>th</sup> and 26<sup>th</sup> of October, 2018.

The meetings at the national level between **8<sup>th</sup> to 12<sup>th</sup> of May 2017** focused primarily on alignment with national priorities (as identified in Section D), coordination (and avoiding duplication) with other development partner initiatives (outlined in Section F), the implementation modality and the target districts and communes. There was also discussion of the climate hazards and underlying vulnerabilities, and the types of vulnerabilities the project should address. Further consultations with the national government took place on **16<sup>th</sup> and 25<sup>th</sup> of October 2018**.

At the local level in both provinces, discussions with local officials went into greater detail on the priority areas, the development challenges/underlying vulnerabilities they face and the climate hazards. The local level meetings also discussed various adaptation options and investments that are required in the target areas. The meetings with officials of Preah Sihanouk and Kep Provinces identified the proposed climate change projects reflected in the Commune Investment Plan (CIP) that is the official priority investments at the commune level. The Commune Investment Plans offer 'pre-packaged' actions that could enhance alignment between the project and government priorities. Finally, the meetings helped the project design team understand the priorities of the different line departments at provincial level.

The consultation mission also met with other key actors in climate change adaptation and mitigation, including UNDP, the Global Green Growth Institute (GGGI) and UN Environment (in Bangkok).

The second consultation mission took place from the **3<sup>rd</sup> to the 7<sup>th</sup> of July 2017**, and discussed in more detail possible actions and identified the target number of beneficiaries. The objective was to understand the local climate change impacts/effects per commune, (the lack of) community coping mechanism/barriers to building resilience, specific resilience building needs and interest and concerns regarding the proposed project in general. The results are displayed in [Annex 1](#) and inform the background and context section.

Further in-depth discussions with the proposed executing entities<sup>52</sup>, provincial and commune stakeholders were held during a mission from **11<sup>th</sup> to 15<sup>th</sup> of December 2017** to develop the full proposal through a robust stakeholder engagement process, to complete the rapid vulnerability assessment, outline preliminary action plans and develop further the environmental and social safeguards screening and management plan.

The purpose of this mission on national level was to reach agreement with the Executing Entities about the project modality, which is outlined in detail in [Part III. Section A](#).

The mission also held in-depth discussions with Provincial stakeholders in both target Provinces. These meetings contributed in several ways to reiterate the support of provincial officials for the project and

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<sup>52</sup> Note that since these consultations the number of executing entities has been reduced to one – the NCSD

highlighted several adaptation concerns and underlying vulnerability issues. The meeting revealed potential adaptation actions listed in the Commune Investment Plan, reflecting the priority investments at the commune level and the line departments at provincial level.

Through consultation with the target commune councils and vulnerable groups, the mission reconfirmed the issues discussed with provincial level stakeholders and also understood the local issues and smaller scale interventions not covered by the Commune Investment Plan. These meetings also reconfirmed acceptance by the communes, outlined alternative options for increasing resilience and potential environmental and social risks and impacts of the interventions.

Based on comments from the Adaptation Fund Secretariat, a final set of consultations, primarily around providing more detail on the investment programme outlined in Component 3, was undertaken between **October 15<sup>th</sup> and 26<sup>th</sup>, 2018**. The outputs of these consultations are displayed in the investment programme highlighted in [Part II, Section A](#) and in [Annex 2](#). These consultations met the national and sub-national governments, as well as communities, but focused primarily on-site visits and assessments to inform the investment programme and Environmental and Social Safeguards to ensure compliance with the Environmental and Social Policy of the Adaptation Fund.

**Table 14**

*Stakeholder Consultations Held*

Stakeholder, Incl. Role/Function	Consultation Objective	Outcome	Conclusion
Ministry of Environment/National Council for Sustainable Development (NCSD)	<ul style="list-style-type: none"> <li>Re-confirm focal point support</li> <li>Establish preferred target areas</li> <li>Ensure coordination with other, ongoing adaptation activities and policy alignment</li> <li>Agree on project modality and responsibility of implementation</li> </ul>	<ul style="list-style-type: none"> <li>MoE/NCSD has agreed to support the project formulation</li> <li>The target areas named in this concept note were agreed</li> <li>Information was exchanged on existing and planned initiatives in the target area, as highlighted in <a href="#">Part II, Section F</a></li> <li>Arrangement modalities can be found in <a href="#">Part III, Section A</a>; Project Arrangements</li> </ul>	MoE/NCSD as the designated authority will approve the project
National Committee for sub-national Democratic Development	<ul style="list-style-type: none"> <li>Establish NCDD interest in being an executing entity</li> <li>Agree in principle the</li> </ul>	<ul style="list-style-type: none"> <li>NCDD agrees to be an executing partner</li> <li>Funding for local investments would be</li> </ul>	NCDD will also provide written agreement to be an executing partner

	<p>modality for channelling funds to the local level</p> <ul style="list-style-type: none"> <li>• Gain understanding on integrating climate change adaptation into commune and district level plans</li> <li>• Understanding existing technical standard, rules, and regulations</li> <li>• Agree on project modality and responsibility of implementation</li> </ul>	<p>channelled through the NCDD mechanism</p> <ul style="list-style-type: none"> <li>• The project contains provisions to mainstream climate change into commune/district planning</li> <li>• The project follows NCDD's Technical Guidelines for Commune/Sangkat (2009)</li> <li>• Arrangement modalities can be found in <a href="#">Part III. Section A</a>, project arrangements</li> </ul>	
Local officials in Preah Sihanouk Province	<ul style="list-style-type: none"> <li>• Agree target sites</li> <li>• Understand climate change vulnerability and highlight possible adaptation investments</li> <li>• Agree on role in organigram</li> <li>• Identify climate change adaptation projects of the Commune Investment Plans (CIP) of the target Province</li> <li>• Collect missing data for rapid vulnerability assessment</li> </ul>	<ul style="list-style-type: none"> <li>• Target sites agreed</li> <li>• A clear picture of vulnerability and investments established</li> <li>• An updated and agreed organigram was provided</li> <li>• Climate change adaptation projects of each commune received</li> <li>• Missing data for rapid vulnerability assessment collected</li> </ul>	The long-list of target communities is listed in Part I – summary of the project
Communes councils and vulnerable groups in Preah Sihanouk Province	<ul style="list-style-type: none"> <li>• Understand the local climate change impacts/ effects per commune and (the lack of) community coping mechanisms/barriers to building resilience</li> <li>• Understand specific resilience building needs and interest as well as</li> </ul>	<ul style="list-style-type: none"> <li>• Insufficient data and relevant documents were collected</li> </ul>	The collected data of target communities is listed in <a href="#">Annex 1</a> – summary of the community consultation

	<p>concerns</p> <ul style="list-style-type: none"> <li>• Understand trend and impacts of tourism on the communities</li> <li>• Understand the main climate change issues, the impacts of vulnerable groups and climate actions prioritized by the commune council and vulnerable groups that are not reflected by the CIP</li> </ul>	<p>Developed the programme of investments under Component 3</p>	
Local officials in Kep Province	<ul style="list-style-type: none"> <li>• Agree target sites</li> <li>• Discuss climate change vulnerability and highlight possible adaptation investments</li> <li>• Understand provincial priorities of climate change adaptation projects based on the Commune Investment Plan</li> </ul>	<ul style="list-style-type: none"> <li>• Target sites agreed</li> <li>• A clear picture of vulnerability and investment actions established</li> <li>• A list of climate change adaptation projects of the Commune Investment Plan received</li> </ul>	The long-list of target communities is listed in <a href="#">Part I</a> – summary of the project
Commune council and vulnerable groups in Kep Province	<ul style="list-style-type: none"> <li>• Understand the local climate change impacts/ effects per community and (the lack of) community coping mechanisms/barriers to building resilience</li> <li>• Understand specific resilience building needs and interest as well as concerns</li> <li>• Understand trend and impacts of tourism on the communities</li> <li>• Understand the main climate change issues, the impacts of vulnerable groups and climate actions prioritized by the commune council and</li> </ul>	<ul style="list-style-type: none"> <li>• Insufficient data and relevant documents were collected</li> <li>• Developed the programme of investments under Component 3</li> </ul>	The collected data of target communities is listed in <a href="#">Annex 1</a> – summary of the community consultation

	vulnerable groups that are not reflected by the CIP.		
UNDP	<ul style="list-style-type: none"> <li>Gain experience from UNDP on the implementing modality for multi-lateral climate finance projects</li> <li>Improve alignment with the Cambodia Climate Change Alliance, and other climate change projects</li> </ul>	<ul style="list-style-type: none"> <li>Agreement that national execution with funds for local investment channelled through NCDD is effective</li> <li>Confirmation that UNDP has no ongoing activities in the target area, and that the proposed project complements ongoing UNDP initiatives</li> </ul>	No formal further action, but ongoing dialogue to continue
UNCDF	<ul style="list-style-type: none"> <li>Ensure alignment with support provided to NCDD and commune/district planning</li> </ul>	<ul style="list-style-type: none"> <li>Agreement that the commune/ district planning component does not duplicate</li> </ul>	No formal further action, but ongoing dialogue to continue
GGGI	<ul style="list-style-type: none"> <li>Increase alignment with GGGI/MoE's green secondary cities planning work, which will take place in Sihanoukville and Kep</li> </ul>	<ul style="list-style-type: none"> <li>Agreement that GGGI will be a partner, and that there will be information flow to ensure that investments made under this project will be part of the planning work undertaken by GGGI</li> </ul>	GGGI will be a non-financial partner in the project (i.e. no funding from this project)
UNEP	<ul style="list-style-type: none"> <li>Ensure synchronicity with the UNEP coastal adaptation project, which also worked in Prey Nob, and the forthcoming urban Ecosystem Based Adaptation project, which will also work in Kep</li> </ul>	<ul style="list-style-type: none"> <li>The UNEP project has been concluded. All relevant reports regarding this project have been passed to UN-Habitat (and MoE/NCSD).</li> <li>The urban EbA project is yet to start. The proposed project will only work on small-scale infrastructure in Kep</li> </ul>	No formal further action, but ongoing dialogue to continue

In Cambodia, UN-Habitat has been implementing projects that support and strengthen policy interventions, institutional capacity building and community empowerment related to water and

sanitation, climate change adaptation, disaster risk management, gender mainstreaming and youth development, housing and urban planning both national and subnational level. The following section elaborates Table 14, detailing further the consultations that took place with government agencies at the national and sub-national level and development partners during the three consultation missions that supported the formulation of the project.

Consecutive meetings during each mission were held with the proposed executing entities, NCS and the Provincial Halls of both provinces to discuss target areas, appropriate small-scale infrastructure interventions, the overall policy environment and the implementation modality. MoE recommended Prey Nob in Preah Sihanouk province and both the municipality and district in Kep province<sup>53</sup>. The discussions confirmed that the Ministry of Environment will be the executing partner for Components 1&2 and The Provincial Halls of the respective provinces will be the implementing entities for Component 3 (Outputs 3.1 to 3.4 in Kep, Output 3.5 in both Kep and Preah Sihanouk Province, Outputs 3.6-3.8 In Preah Sihanouk).

Climate change resilience and environment is the largest portfolio of UNDP in Cambodia. UNDP also recommended that the project should have a strong linkage with the NCDD. The meeting also discussed the technicalities of capacity building at the local level, with UNDP recommending that local officials take a place on the project board.

The mission met with the Global Green Growth Institute (GGGI), which is implementing activities under the framework of the Green Urban Development Programme. This programme produced the green city strategic plan, which is now officially adopted and has been incorporated into the environmental law and code. GGGI is also developing a national strategic plan for green secondary cities, and develop green strategic plans for 6 cities, likely including Kep and Sihanoukville. GGGI is also developing an overall framework at the national level and planning at the city level. These combined works provide scope for alignment with the proposed project.

UN-Habitat met with officials from Preah Sihanouk province, including representatives from the Department of Environment, the Fisheries Administration, NCDD and the Provincial Hall Administrative Department. There is limited donor footprint in these areas with no donors currently investing in resilient housing, protective infrastructure or water supply. The participants agreed with the proposed mechanism of project implementation, which partners with MoE for national policy development and trainings while partnering with the respective Provincial Halls for fund-flows to the investment. This mechanism is also identified to match with the national strategic plan and the IP3-III.

The meeting with provincial officials in Kep included representation from the Department of Environment, Department of Tourism, Fisheries Administration, Department of Water Resources and Meteorology, Department of Public Works and Transport, the Provincial NCDD Advisor and the Department of Administration under Provincial Hall. The meetings discussed the priority actions which contributed to the selection of actions highlighted in Outputs 3.1 to 3.5.

UN-Habitat conducted community consultation in the communities of Preah Sihanouk and Kep Province. Based on the guide on community-level vulnerability assessments and action planning, requisite data including community profiles and tourism were collected through interviews and relevant documents. All of collected data were summarized in [Annex 1](#). Further in-depth consultations

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<sup>53</sup> Kep Province is made up of 1 municipality and 1 district

were held with the commune councils of 14 target communes<sup>54</sup>, including vulnerable groups. These consultations identified the climate change hazards per commune and helped to understand the necessary and prioritized adaptation action planning in each commune, beyond and independent from the small-scale interventions addressed in the Commune Investment Plans. These consultations heavily influenced the investment programme of the project outlined in Outputs 3.1 – 3.8.

## I. JUSTIFICATION

The proposed project components, outcomes and outputs fully align with national and local government/institutional priorities, with identified community and vulnerable groups needs and with five of the Adaptation Fund’s seven outcomes ([See Part II, Section A](#)) as stated in the Adaptation Fund results framework. This alignment has resulted in the design of a comprehensive approach in which the different components strengthen each other and in which outputs and activities are expected to fill identified gaps in Cambodia’s climate change response.

The project maximises the funding amount for the investments programmed under Component 3. It allocates 86 per cent of the project budget (excluding executing costs and project cycle management) to investments in Component 3. The funding for soft activities under Components 1&2 is required for complementarity/support for Component 3 and sustainability and quality assurance of the project. The table below provides a justification for the funding requested, focusing on the full cost of adaptation reasoning by showing the impact of AF funding compared to no funding (baseline) related to expected project outcomes.

### Table 15

#### *Project justification table*

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*54 Because the project will not implement the concrete component in Koh Rong and logistical constrains, the mission from 11th to 16th of December 2017 did not visit the Koh Rong commune, an island about 27 km from the mainland*



Outcomes/ Planned Activities	Baseline (Without AF)	Additional (With AF)	Comment and Alternative Adaptation Scenarios
<b>Output 1.1.</b> Community capacity built to collect and manage solid waste	Solid waste is problematic in the target areas with little capacity to manage it or recognise the problems to causes to water management infrastructure and the environment	People will have the capacity to organise their waste so that it does not block critical infrastructure and can be collected from collection points on the main road	The alternative would be to replace solid waste affected infrastructure with new infrastructure, a vastly more expensive option that would not guarantee positive adaptation benefits and would carry more environmental and social safeguarding risks
<b>Output 1.2.</b> Communities in target areas have been trained on resilient house construction techniques	Up to 200 households per commune are damaged every year due to storms and people lack the capacity to build more resilient houses	9,720 will benefit from training	The alternative would be to replace the existing housing stock with externally build houses, but in a way that does not build the capacity of local people
<b>Output 1.3.</b> Communities have been organised to manage, monitor and maintain the infrastructure investments under Component 3,	Communities don't have the capacity to manage basic infrastructure	Basic maintenance of infrastructure is conducted by communities	External contractors conduct maintenance which is costly and potentially less reliable
<b>Output 2.1</b> Government officers at the provincial and districts/cities trained to plan effectively for sustaining and enhancing the project's adaptation benefits	Capacity building is still in an early stage at present, meaning additional capacity is required to plan for the impacts of climate change.	Capacity is enhanced, enabling the implementation of adaptation actions identified as a result of work undertaken in Component 1.  100 government officials from the provincial and district levels have also been trained.	Capacity building, ongoing under the support of NCDD, is currently slowing. This means urgent action required to adapt to climate change will not be forthcoming.

<p><b>Output 2.2</b> Government officers at the provincial and district provided with comprehensive technical training to manage, operate and maintain the infrastructure</p>	<p>Capacity on technical management is limited to the national level and 1-2 engineers at the provincial level</p>	<p>A core team of 40 engineers, architects and ecosystem experts trained across the whole project area</p>	<p>There is currently no other capacity building effort of this nature, meaning that technical maintenance beyond the capacity of the community would not be conducted, or would rely on external contractors</p>
<p><b>Output 2.3:</b> Institutional systems strengthened to monitor adaptation investments and replicate their benefits</p>	<p>Institutional systems are limited, especially considering the recent withdrawal of NCDD advisors at the provincial level</p>	<p>Strengthened capacity of target provinces to respond climate change through the Cambodian government planning and budgeting system</p>	<p>There is no adaptation alternative – without support the provincial level would not have the capacity to respond through the sub-national planning system to climate change.</p>
<p><b>Output 3.1.</b> 285ha of Mangroves restored in Kep City and Angkaol Communes, Kep Province</p>	<p><b>Vulnerability Baseline</b> Salt water incursion, coast flooding and coastal erosion</p>	<p><b>Adaptation Benefit resulting from the project</b> Improved agriculture, access to drinking water and coastal defence</p>	<p><b>Alternative scenario</b> Building sea walls would be the alternative action to achieve the same result, but would be much less cost effective and create substantial additional ESS risks</p>
<p><b>Output 3.2</b> Water gates repaired in 3 locations in Pong Teuk and Angkaol  2 canals rehabilitated in Pong Teuk and Angkaol Communes, Kep Province</p>	<p>Water is mismanaged, causing both draughts and floods, in an area of declining rainfall</p>	<p>Improved access to water for agriculture, leading to greater yield. Increased water availability for drinking/domestic use</p>	<p>The alternative would be to build a water treatment plant or similar infrastructure, which would be prohibitively expensive</p>
<p><b>Output 3.3</b> Prevention of salt water ingress through improved channels</p>	<p>As above</p>	<p>As above</p>	<p>As above</p>

<p><b>Output 3.4</b> O Thmar Reservoir rehabilitated to increase water storage capability Kep Province</p> <p>Bank strengthening work at Roness Reservoir to provide additional water retention and safety.</p>	<p>O Thmar reservoir is currently incapable of storing sufficient water, and is plagued by leaks and poor management. Roness is also incapable of storing sufficient water and its southern bank is in an unsafe condition</p>	<p>As above</p>	<p>The alternative would be two new reservoirs at different sites. However, this is difficult for cost and environmental and social safeguard reasons</p>
<p><b>Output 3.5</b> Resilient Housing designs developed and demonstrations constructed (both provinces)</p>	<p>Strong winds damage up to 200HH per commune every year</p>	<p>Poor households will be damaged as a result of strong winds and therefore will not have to invest their minimal savings in repairs</p>	<p>The alternative would be relocation of the affected households, either to other, less vulnerable areas, or into social housing. However, this carries substantial Environmental and Social Risk</p>
<p><b>Output 3.6</b> Raised embankment and Watergate repair in Ou Ohkna Heng Commune, P. Sihanouk Province.</p>	<p>Sea water affects land and ground water in three communes, affecting agricultural yield and drinking water</p>	<p>People in the three target communes will be protected from sea-water and coastal flooding</p>	<p>The alternative would be to build a sea-wall. However, this is a highly costly activity and it would carry substantial environmental and social risks</p>
<p><b>Output 3.7</b> Drainage and Rainwater Harvesting installed at Veal Rinh Market, P. Sihanouk Province</p>	<p>Heavy rains lead to flooding which temporarily closes the market, resulting in lost income</p>	<p>People will be protected from flooding and earn a year-round income. Moreover, water will be supplied from rainwater</p>	<p>The alternative action would be to re-locate or reconstruct the market, which would be highly costly, requiring new land and not guaranteed to bring adaptation benefits</p>
<p><b>Output 3.8</b> Tide gauge with early warning system broadcast capabilities installed Tide Gauge in Ou Ohkna Heng Commune, Prey Nob</p>	<p>Floods and storms damage households, agricultural lands, and jeopardise coastal fisheries partly because people don't have</p>	<p>People will have improved information, allowing them to make more informed decisions and take additional measures to</p>	<p>There is no viable alternative to this action, other than to continue business as usual, which is causing damage to houses, land</p>

access to reliable information

safeguard themselves during the rainy season.

and jeopardising coastal fisheries

## J. SUSTAINABILITY

The project aligns with the Cambodian government's planning and implementation mechanism and strengthens it. This is because NCS, the implementing partner will work directly with the local government in each province, promoting alignment with sub-national planning at the commune and district level. Through the activities under Component 2 of the project, the target districts and provinces will be enabled to plan for small-scale resilient investments, and to programme their maintenance more effectively. UN-Habitat will further design an exit strategy addressing all institutional levels to ensure the long-term and sustainable benefits of this project

INVESTMENT	MAINTENANCE ARRANGEMENT
<b>Output 3.1</b> 285ha of Mangroves restored in Kep City and Angkaol Communes, Kep Province	Develop a Mangrove Planting and Monitoring Plan as the first activity in the implementation. After the project, the Fisheries Administration of Kep and Preah Sihanouk Provinces would be responsible for care for the mangrove areas, in conjunction with the communities living adjacent to them.
<b>Output 3.2</b> a) Water gates repaired in 3 locations in Pong Teuk and Angkaol  b) 2 canals rehabilitated in Pong Teuk and Angkaol Communes, Kep Province	Communities will be organised under Output 1.3 to perform basic management and maintenance of both the water gates and the canals. Output 1.1 will also enhance sustainability because it will prevent damage and reduced functionality through solid waste clogging.  Government capacity to manage and maintain will be strengthened under Output 2.2. Responsibility for ongoing management lies with the Provincial Department of Water Resources and Meteorology, Kep Province.
<b>Output 3.3</b> Prevention of salt water ingress through improved channels	Communities will be organised under Output 1.3 to perform basic management and maintenance of the channels and supporting infrastructure.  Government capacity to manage and maintain will be strengthened under Output 2.2. Responsibility for ongoing management lies with the Provincial Department of Water Resources and Meteorology, Kep Province.
<b>Output 3.4</b> a) O Thmar Reservoir rehabilitated to increase water storage capability Kep	Communities will be organised under Output 1.3 to perform basic management and maintenance of both reservoirs.

<p>Province</p> <p>b) Bank strengthening work at Roness Reservoir to provide additional water retention and safety.</p>	<p>Government capacity to manage and maintain will be strengthened under Output 2.2. Responsibility for ongoing management lies with the Provincial Department of Water Resources and Meteorology, Kep Province.</p>
<p><b>Output 3.5</b> Resilient Housing designs developed and demonstrations constructed (both provinces)</p>	<p>The communities will be trained to manage their own houses and replicate the activity under Output 1.2</p> <p>The Provincial Departments of Urban Planning, Land Management and Construction in both provinces will be responsible for management and maintenance of the demonstration houses (with active collaboration from the target Communes).</p>
<p><b>Output 3.6</b> Raised embankment and Watergate repair in Ou Ohkna Heng Commune, P. Sihanouk Province.</p>	<p>Communities will be organised under Output 1.3 to perform basic management and maintenance of the water gates.</p> <p>Government capacity to manage and maintain will be strengthened under Output 2.2. Responsibility for ongoing management lies with the Provincial Department of Water Resources and Meteorology, Preah Sihanouk Province.</p>
<p><b>Output 3.7</b> Drainage and Rainwater Harvesting installed at Veal Rinh Market, P. Sihanouk Province</p>	<p>Communities will be organised under 1.1 to improve solid waste management, which will support continued functionality of the market's drainage infrastructure.</p> <p>Government capacity to manage and maintain will be strengthened under Output 2.2. Responsibility for ongoing management lies with the Provincial Department of Water Resources and Meteorology, Preah Sihanouk Province.</p>
<p><b>Output 3.8</b> Tide gauge with early warning system broadcast capabilities installed Tide Gauge in Ou Okhna Heng Commune, Prey Nob District</p>	<p>Government capacity to manage and maintain will be strengthened under Output 2.2. Responsibility for ongoing management lies with the Provincial Department of Water Resources and Meteorology, Preah Sihanouk Province.</p>

The social, economic, financial and environmental sustainability of the investments described below.

### **Social**

By implementing the project through the People's Process methodology, whereby people take ownership for the design and construction of the infrastructure that they will ultimately be beneficiaries of, there will be greater social sustainability because people will take ownership of their adaptation infrastructure. In implementing the investments under Component 3, communities will gain greater awareness of climate change and adaptation, and vocational skills to build, operate and maintain infrastructure.

### ***Economic***

Adaptation is a highly important economic activity in the target areas. The activities to improve resilient housing, for example, under Outcomes 1.2 and 3.5, will bring sustainable economic benefits because people will not be forced to invest their minimal savings or get into debt to afford house repairs. The activities under outputs 3.2, 3.3, 3.4 and 3.6 will enhance people's access to water, making their land more productive and carrying health benefits for them. The mangrove plantations under Output 3.1 will also defend people's land and also bring additional economic benefits in terms of improved fish and crab catch. The activities under Output 3.7 to improve flood resilience at Veal Rinh market will also bring economic benefits because people will no longer lose at least 30 days of income per year due to floods. The economic benefits of the actions – especially the investment programme under Component 3 – are quantified in [Part II Section C](#) of this proposal.

### ***Financial***

Financial sustainability of the project's benefits is ensured by executing the project through the NCSD, working with the Provincial Halls of the two target provinces. Provincial halls have a coordinating function at the sub-national level. Provincial halls are best placed to do the following at the sub-national level:

- Partner with the Department of Planning and the NCDD to ensure that investment planning includes maintenance of the infrastructure, as well as replicating its successes in other areas.
- Mobilize national finance to support future upscaling as the Provincial Halls sit under the Ministry of Interior and have a powerful voice to demand further sub-national action.
- At the national level, NCDD, which is also under the Ministry of Interior, is applying to become a Green Climate Fund direct access entity. If this happens during the lifespan of the project, the target areas will be well-positioned to advocate for leveraging further finance through this modality.

These steps are being taken to mitigate the risk that infrastructure may not be properly maintained in the future. This has been the case on some projects in the past that have not been implemented with sufficient government support or buy-in. The sea wall targeted under Output 3.6, for example, was constructed in 2002-3 with support from a bilateral donor, and has since fallen into disrepair.

The NCSD is the executing agency for this project. The project's governance structure combines the Ministry of Environment, the two target provinces and a variety of other important stakeholders at the national level. Further information on the management structure is presented in [Part III, Section A](#). The need for further and sustained finance will be a key consideration for all the executing partners as the project is under implementation.

## K. ENVIRONMENTAL AND SOCIAL IMPACTS AND RISKS

**Table 16**

*Overview of the environmental and social impacts and risks identified as being relevant to the project.*

Checklist of Environmental and Social Principles	No Further Assessment Required for Compliance	Potential Impacts and Risks – Further Assessment and Management Required for Compliance
Compliance with the Law	X	
Access and Equity		X
Marginalized and Vulnerable Groups		X
Human Rights		X
Gender Equity and Women’s Empowerment		X
Core Labour Rights		X
Indigenous Peoples	X	
Involuntary Resettlement		X
Protection of Natural Habitats		X
Conservation of Biological Diversity		X
Climate Change	X	
Pollution Prevention and Resource Efficiency		X
Public Health		X
Physical and Cultural Heritage	X	
Lands and Soil Conservation		X

As shown in Table 16, the project seeks full alignment with Adaptation Fund’s Environmental and Social Policy (ESP), and will also be compliant with to UN-Habitat’s Environmental and Social Safeguards System. This section briefly describes the initial analysis of environmental and social impacts of the project based on the ESP.

As shown in Table 17 and [Annex 3](#) the project seeks full alignment with Adaptation Fund's Environmental and Social Policy (ESP) and will also be screened according to UN-Habitat's Environmental and Social Safeguards System and policy. This section briefly describes the initial analysis of environmental and social impacts of the project based on the Environmental and Social and Gender Policies.

Components 1 & 2 consist entirely of soft activities. The Adaptation Fund's ESP says, "Those projects/programmes with no adverse environmental or social impacts should be categorized as Category C.<sup>55</sup> However, they have been subjected to a comprehensive screening, as presented in [Annex 3](#). It has been determined that these activities will not cause direct, indirect transboundary and cumulative impacts to environment and society.

All physical works activities in the project will be undertaken under Component 3. These activities carry the risk of causing environmental and social impacts. As the activities implemented under the project will be local and small scale, it is deemed that they are not 'Category A' risks. All activities implemented under Component 3 are, therefore, Category B or C. Capacity building under Component 1 (at the community level) and Component 2 (at the level of the sub-national government) will emphasise environmental and social safeguards and minimizing environmental and social, as well as project implementation risks, and the integration of gender and youth issues.

Moreover, the using the People's Process as a means to implement means that communities will manage the planning and construction of infrastructure, be trained on environmental and social risks and therefore will be incentivized to minimize environmental and social impact. This is because, under the People's Process, communities themselves are the planners, constructors and beneficiaries of the small-scale infrastructure, rather than contractors. Contractors have less incentive to minimise environmental and social risks, because they are not the end users of the infrastructure in question.

The checklist shown in Table 16 has been prepared based on the extensive consultations that took place in formulating the proposal, which were conducted with the Adaptation Fund Environmental and Social Policy and UN-Habitat's Environmental and Social Safeguard System, as well as the AF Gender Policy, in mind This is further elaborated in Table 17, below, and the Environmental and Social Management plan in [Part III, Section C](#).

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*55 Adaptation Fund Environmental and Social Policy, paragraph 28, Page 8*



**Table 17**

*Risk Assessment Overview*

			RISK ASSESSMENT			
Investment	Target Province/ Communes	Estimated Number of Beneficiaries	Impact Description of Potential Risk (Considering The 15 AF Principles)	Significance of Impact of Potential Risk*	Proposed Risk Mitigation / Justification of Risk Reduction / Mitigation Incorporated Within Design	
3.1	Mangrove plantations for improved coastal resilience	Prey Thom, Kep, Pong Teuk and Angkaol Communes, Kep Province and Prey Nob Commune, in Prey Nob District	17,754	<p>3 – Poor and informal settlements, women, elderly, disabled and youth have been consulted, however, while there is always a risk that marginalised and vulnerable groups may be negatively impacted due to rehabilitation works, there are no anticipated issues regarding marginalised groups as there is no potential for discrimination or favour in the protections offered by the mangrove plantations.</p> <p>6 – Specialist labour external to commune workforce may be required. Need to ensure any contractors engaged for rehabilitation works comply with ILO standards, 9 – Rehabilitation works if not undertaken properly and in accordance with a Mangrove</p>	<p>3 - low 6 - low 9 - low</p>	<p>3 – Continued consultation with minority groups and inclusion within Mangrove Management plan.</p> <p>6 - Planting the mangrove will draw upon labour from the community. For further information about how core labour rights are protected under the People’s Process approach, please also see <a href="#">Annex 3</a>.</p> <p>Compliance with ILO standards by, for example, providing safety equipment (where necessary), employing adults under contracts, non-discrimination and paying fair salaries above the national minimum wage.</p> <p>9 - A Mangrove Planting Management Plan will be developed and implemented to ensure that selected mangroves for plantation are suitable for the environment and will support the local ecosystem. An ecologist trained in mangrove ecology to be involved in development of the plan.</p>

				Management plan, could have an impact on surrounding coastal habitats.		
3.2 a	Water gate repair	Kep Province Angkaol and Pong Tuek	Angkaol – 8,566 Pong Teuk – 10,987	<p>2- All groups within communes consulted in depth, no expression of concern of unequal access. There exists a risk that an intervention may not be accessible to the entire community. However, research and consultation undertaken confirms expectation that entire communes would benefit.</p> <p>3 - Poor and informal settlements, women, elderly, disabled and youth have been consulted, however, while there is always a risk that marginalised and vulnerable groups may be negatively impacted due to rehabilitation works, there are no anticipated issues regarding marginalised groups as there is no potential for discrimination or favour in the protections offered by the mangrove plantations.</p> <p>Specialist labour external to commune workforce may be required. Need to ensure any contractors engaged for rehabilitation works comply with ILO standards, by, for example, providing</p>	<p>2- moderate</p> <p>3- low</p> <p>6- low</p> <p>12- low</p> <p>13 - low</p>	<p>2 - The repair of the gate will improve the access to water to the community. The gates make it possible to have controlled waterflow and thereby improve the existing water system. Because the water bodies are all public land, it is expected that the water will be a ‘public good’ whereby it will not be possible to prevent individuals or groups from using it. Indeed, it will enhance the ability of all target beneficiaries to access water.</p> <p>3 - Continued consultation with any minority groups identified during project implementation.</p> <p>6 - Safety equipment will be required for workers on the site. For further general information on Core Labour Rights as part of the Environmental and Social Safeguard approach of the project, please refer to the proposal document, <a href="#">Part II, Section K</a>. Need to ensure any contractors engaged for rehabilitation works comply with ILO standards, by, for example, providing safety equipment (where necessary), employing adults under contracts, non-discrimination and paying fair salaries above the national minimum wage.</p> <p>12 - Resource efficiency is improved by the installation of the gate and repair of the other two structures. Possibilities to divide the water makes the communes more resilient to longer periods of draught with more efficient resource management.</p>

				<p>safety equipment (where necessary), employing adults under contracts, non-discrimination and paying fair salaries above the national minimum wage.</p> <p>12 – Impact on water quality within adjacent canal during construction (e.g use of cement). Improper design of water gate could impact water quality and flow. Verification of design required upon inception.</p> <p>13 - The storage of fresh water increases the access to fresh water, which is beneficial to public health.</p>		<p>13 - Need to ensure all contractors comply to health standard</p>
3.2 b	Canal rehabilitation			<p>4 - The land through which the canals traverse is a combination of public / informal and residential use. This was confirmed via consultations. Project must not impede on tenure arrangements or property rights.</p> <p>8 - Although inhabitants (including directly affected) proposed and confirmed agreement with rehabilitation of the canals in Angkaol and Pong Teuk Communes, the project will ensure inhabitants are not resettled involuntarily due to changes in water flow.</p> <p>9 - Rehabilitation works within and surrounding the canal could have an</p>	<p>4 - low 8 - moderate 9 – low 10 – low 12 – low 13 - low</p>	<p>4 - Neither the capacity building programme nor the rehabilitation of the canals will conflict with human rights. Further follow up consultation through project implementation should be undertaken to ensure all beneficiaries accept works and that tenure arrangements and property rights are not violated.</p> <p>8 - The works all involve work on public state-owned land. Therefore, no involuntary resettlement is required. No one is currently occupying the land that is being used, and the repair work on the canals will not involve flooding or any other displacement that could force the resettlement of nearby people. Ongoing consultation through implementation phase should be undertaken to ensure this is still the case.</p> <p>9 - The area where the gates are constructed is solely agricultural land. No natural habitat is</p>

				<p>impact on the surrounding natural habitat. Although no critical habitat or protected areas are confirmed within the works area, all care needs to be taken to ensure no degradation of natural habitat.</p> <p>10 - Rehabilitation works within and surrounding the canal could have an indirect impact on biological diversity.</p> <p>12 - Impact to water quality within adjacent canal during construction (e.g. use of cement). Improper design of canal could impact water quality and flow. Verification of design required.</p> <p>13 - The rehabilitation of the canals prevents flooding, therefore reduces chances of negative effects on public health by reducing the spread of contaminated water.</p>		<p>endangered by canal repair works. Although accessing the terrain temporarily might be crossing private property. To prevent damage to crops, rehabilitation work needs to be planned in between cropping cycles.</p> <p>10 - Rehabilitation of the canals can cause temporarily disturbance of species living in the canals. By doing the work in section and keeping the water flow at all times will limit the damage to species.</p> <p>12 - Resource efficiency is improved by relining the canals. The larger discharge capacity makes the commune less vulnerable to climate change and allows for more efficient resource management.</p> <p>13 - Need to ensure all contractors comply to health standards.</p>
3.4	<p>a) O Thmar reservoir enhancement</p> <p>b) Bank strengthening</p>	Kep Province Angkaol Commune	14,060	<p>4 - The land in which the existing reservoir is structured is a combination of public / informal and agricultural use. This was confirmed via consultations. Project must not impede on tenure arrangements or property rights.</p> <p>6 - Specialist labour external to commune workforce may be required. Need to ensure any</p>	<p>4 – low</p> <p>8 – low</p> <p>9 – low</p> <p>10 – low</p> <p>12 – low</p> <p>13 – low</p> <p>15 – low</p>	<p>4 - Enhancements to the reservoir are not anticipated to raise any issues regarding human rights. Further follow up consultation through project implementation should be undertaken to ensure all beneficiaries accept works and that tenure arrangements and property rights are not violated.</p> <p>6 - Labour rights and safety are of particular interest by restoring the reservoir. Choosing a contractor with the right requirements in this project is highly essential for risk mitigation. Engineering certification</p>

<p>work at Roness Reservoir to provide additional water retention and safety.</p>			<p>contractors engaged for rehabilitation works comply to ILO standards</p> <p>8 - Although inhabitants (including directly affected) proposed and confirmed agreement with the need to enhance the reservoir project needs to ensure inhabitants are not resettled involuntarily due to changes in water flow.</p> <p>9 – Works on the reservoir could have an impact on the surrounding natural habitat. Although no critical habitat or protected areas are confirmed within the works area, all care needs to be taken to ensure no degradation of natural habitat.</p> <p>10 - Embankment works and construction of water gate could have an indirect impact on biological diversity.</p> <p>12 - Impact to water quality within reservoir and adjacent canal system during construction (dredging work). Improper design could impact water quality and flow. Verification of design required.</p> <p>13 – The enhanced reservoir should benefit public health by improving crop production. There are no anticipated negative effects.</p>	<p>required.</p> <p>Need to ensure any contractors engaged for rehabilitation works comply with ILO standards, by, for example, providing safety equipment (where necessary), employing adults under contracts, non-discrimination and paying fair salaries above the national minimum wage.</p> <p>8 - The works all involve work on public state-owned land. Therefore, no involuntary resettlement is required. Project implementation to ensure no change to settlements.</p> <p>9 - The water reservoir is not appointed as natural habitat protection area. However, all care will be taken through construction to ensure no degradation of natural habitat.</p> <p>10. The waterbody in its current state is home to vegetation and aquatic plant life but has no official status as natural habitat. O Thmar is not a natural lake and it is not in a protected area, however, dredging will lower the biological diversity temporarily. The use of a silt curtain or to contain sediment during dredging works will be implemented to protect aquatic plants as far as possible.</p> <p>12 - Water resources management enlarges with the enhancement of the reservoir. Creating a more sustainable fresh water source.</p> <p>15 – The excavation works in O Thmar will remove sediment and other material from the bottom of the reservoir. Where possible, this will be re-used in the</p>
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						activities under 3.3. and in the strengthening of the embankment at Roness.
3.5	Resilient housing	Kep Province and Prey Nob District All Communes	9,720	<p>2- All groups within communes consulted in depth, no expression of concern of unequal access. There exists a risk that an intervention may not be accessible to the entire community. Research and consultation undertaken confirms expectation that entire communes would benefit.</p> <p>3 - Impoverished and informal settlements, women, elderly, disabled and youth (where possible) have been consulted, however there is always a risk that marginalised and vulnerable groups may be negatively impacted due proposed interventions. There are no anticipated issues regarding marginalised groups as none were identified as being located within these communes.</p> <p>4 - The land to which these interventions is applicable is a combination of public / informal and residential use. This was confirmed via consultations. Project must not impede on tenure arrangements or property rights.</p>	<p>2 – low</p> <p>3 – low</p> <p>4 – low</p> <p>5 – low</p> <p>6 – low</p> <p>13 - low</p>	<p>2 – This project will not exacerbate existing inequities. Education opportunities provided within this project will be targeted to the marginalised and/or enhance the local capacity of the region which is in turn beneficial to all. The location of demo houses will be on state public land and re-confirmed before construction to ensure access and equity for all beneficiaries.</p> <p>3 - This project should: provide new economic and livelihood options to the marginalised; improve housing resilience for the marginalised and vulnerable. Continued consultation with any minority groups identified during project implementation.</p> <p>4 - Continued consultations will take place throughout project implementation to ensure all beneficiaries accept works and that tenure arrangements and property rights are not violated.</p> <p>5 - The housing resilience project will aim to provide equal training opportunities to both men and women. Women will benefit from resilient houses because they are more likely to stay at home, are more likely to be affected by damage to houses and are more likely to source materials for the repair of houses</p> <p>6 - Safety equipment will be required for workers on the site. For further general information on Core</p>

				<p>5 – There exists a risk that housing resilience capacity building focuses predominantly on the male population.</p> <p>6 - Specialist labour external to commune workforce may be required. Need to ensure any contractors engaged for rehabilitation works comply to ILO standards</p> <p>13 – There is a risk that if proper training is not provided for both housing resilience and how to properly use and benefit from the tide gauge, safety issues may continue.</p>		<p>Labour Rights as part of the Environmental and Social Safeguard approach of the project, please refer to the proposal document, <a href="#">Part II, Section K.13</a> - The tide gauge should enhance public safety by assisting with adverse weather forecasting. The housing resilience program assists with the provision of safer housing for the marginalised during adverse weather events. Continued engagement with community with regards to development of housing styles and construction techniques, and development of hazard maps is critical.</p>
3.6	Repair of water gates and low points along sea defence	Prey Nob District Ou Oknha Heng, Prey Nob, Ou Chou and Veal communes	20,000	<p>2 – All groups within communes consulted in depth, no expression of concern of unequal access. There exists a risk that an intervention may not be accessible to the entire community. Research and consultation undertaken confirms expectation that entire communes would benefit.</p> <p>3 – Impoverished and informal settlements, women, elderly, disabled and youth (where possible) have been consulted, however there is always a risk that marginalised and</p>	<p>2 – low 3 – low 5 – low 6 – low 8 – low 9 – moderate 10 – low 11 – low 15 - moderate</p>	<p>2 - The investment will deliver reduced instances of salt water ingress into agricultural land, improving the likelihood of high crop yields and protecting the income and food supply for a significant number of people in the Prey Nob district. The agricultural and fishing communities living in the informal areas of settlement will experience improved access and improved food security.</p> <p>The investment will not discriminate in the services it provides to the target beneficiaries.</p> <p>3 - There are no anticipated issues regarding marginalised groups. There is some old data to suggest that small number of undocumented ethnic Vietnamese live in Prey Nob District, but this</p>

vulnerable groups may be negatively impacted due proposed interventions. There are no anticipated issues regarding marginalised groups as none were identified as being located within these communes.

5 – There exists a risk that this investment (while being implemented) focuses benefits predominantly on the male population with regards to local labour force.

6 – Specialist labour external to provincial workforce may be required. Need to ensure any contractors engaged for rehabilitation works comply to ILO standards

8 – Although inhabitants (including directly living along the embankment/sea defence) proposed and confirmed agreement with the need to prepare water gate and low points along sea defence project needs to ensure inhabitants are not resettled involuntarily due to changes in water flow.

9 – Works on the sea defence and water gate could have an impact on the surrounding natural habitat.

was cross-checked with the elected Commune Council representatives and provincial level officials, who both assert that all undocumented ethnic Vietnamese have now been formalized and given Cambodian identity papers.

As above, there is no potential for discrimination in the benefits provided by the infrastructure this investment will provide.

5 - In the poor communities affected by the proposal it was observed that women tend to take more of a household and community management role and therefore they are likely to benefit further from the community's improved crop yield, as they will be likely to take on the role of selling surplus crops. The men will benefit from improved yields from their labour. If the road overtops less frequently there will also be improved access to the market for all.

6 - Safety equipment will be required for workers on the site. For further general information on Core Labour Rights as part of the Environmental and Social Safeguard approach of the project, please refer to the proposal document, [Part II, Section K](#).

Need to ensure any contractors engaged for rehabilitation works comply with ILO standards, by, for example, providing safety equipment (where necessary), employing adults under contracts, non-discrimination and paying fair salaries above the national minimum wage.

8 - There is no resettlement required as a result of this investment implementation. Without this



Although in many areas the existing mangroves have been cleared and cut down for use as building materials, they are now considered protected area and all care needs to be taken to ensure no degradation of natural habitat.

10 – Works on the sea defence and construction of water gate could have an indirect impact on biological diversity.

11 – There will be necessary but controlled CO<sub>2</sub> emissions associated with the construction period only.

12 – Impact to water quality within estuary and adjacent canal system during construction (grading works, use of cement). Improper design could impact water quality and flow. Verification of design required.

15 – There is a risk that improper design and construction of the sea defence and water gate repair works may result in negative impacts to soil and underlying groundwater condition. Design verification and construction supervision required.

investment, resettlement of the informal communities living along the ocean side of the embankment would be inevitable.

9 - The investment will help to maintain the boundary between salt water mangrove and cultivated rice paddies. As such it will help to prevent further erosion of the mangrove forest. There are areas of mangrove to seaward of the existing flood defence embankment that appear to have been previously cleared for cultivation but are now returning to nature. A separate investment will address re-planting these areas.

10 - Material imported to repair and consolidate the embankment should be environmentally screened to ensure that there are no invasive species brought to site.

11 - The investment will help to offset the effects of climate change for the poor local communities. There will be necessary but controlled CO<sub>2</sub> emissions associated with the construction period only. However, this will be temporary and controlled via use of well-maintained equipment and pollution control measures

12 - Environmental safeguards will be applied during the construction works to ensure no cement or oils are allowed into the environment. The works will reduce the instances of pollution by improving performance of the existing embankment and water gates to better control flood flows.

15 - The investment should reduce the instances of

						salinization and soil degradation by preventing upstream salt water ingress. This will improve the quality of the agricultural soil. Design and construction methodologies to be certified by a suitably qualified engineer.
3.8	Tide gauge with early warning system broadcast capabilities installed Tide Gauge in Ou Okhna Heng Commune, Prey Nob	Ou Okhna Heng Commune	30,000	No discernible risks		

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# PART III

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## PART III: IMPLEMENTATION ARRANGEMENTS

### A. ARRANGEMENTS FOR PROJECT MANAGEMENT

The following mechanisms for project execution, coordination and oversight have been agreed in close consultation with the Ministry of Environment (MoE), as the national designated authority to the Adaptation Fund, the National Council for Sustainable Development (NCS), the inter-ministerial body chaired by H.E. Minister of Environment and the sub-national government in the two target provinces.

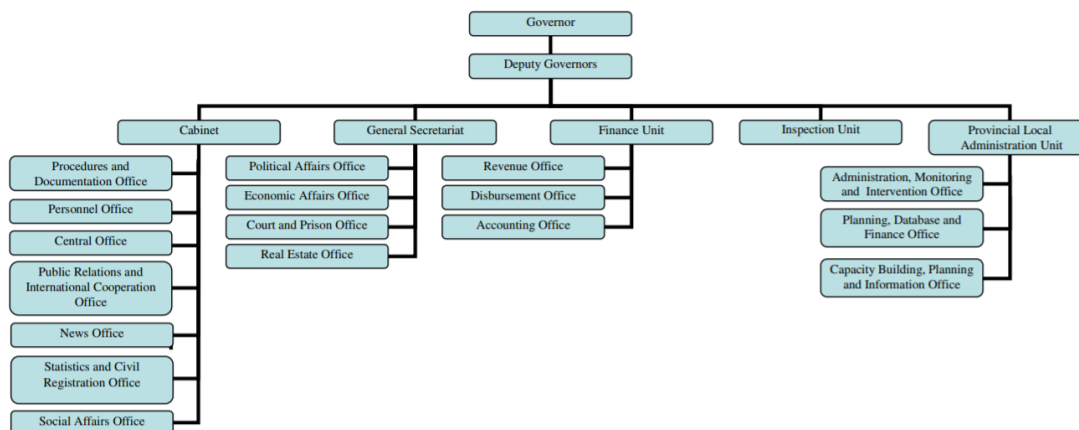
The project will be executed at three levels; 1) national, 2) provincial (with support from the districts) and 3) commune. At the national level, the overall coordination of the project's execution will be led by the NCS, who will be the signatory of the project MoU and AoC with UN-Habitat. The NCS will also ensure that the project is executed in a timely manner, chair the Project Management Committee and coordinate its activities and results across the Cambodia government system. The NCS will work directly with the Ministry of Environment for the execution of Components 1&2, and the Provincial Halls of Kep and Preah Sihanouk Provinces to execute Component 3.

The NCS will then work with **Provincial Halls of Kep and Preah Sihanouk Provinces** at the Provincial Level to execute Component 3 of the project. NCS will work with the Provincial Hall of Kep Province to execute activities under Outputs 3.1 – 3.5 of the project, while NCS will work with the Provincial Hall of Preah Sihanouk Province to execute the activities under Outputs 3.6 – 3.8 of the project.

In the Cambodian government system, Provincial Halls are the main provincial level administration unit, headed by a governor, they coordinate the other line departments at the provincial level, and are accountable to the Ministry of Interior. The Provincial Governors of the two respective target provinces will be signatories to the agreement with UN-Habitat to execute the project, while the day-to-day oversight of the project will be the responsibility of the Provincial Administration Unit. The structure of the Provincial Halls is shown below in Figure 12.

The Provincial Halls will then coordinate with other provincial departments to deliver the physical works. The table below shows the execution responsibility. Note that in this table, the executing entity is characterized by fund flow – they will receive funding from UN-Habitat. The executing partner is a key agency involved in delivering the activities, who will organize and facilitate accordingly.

Thirdly, the commune councils, elected bodies that work in each commune, will support the project's implementation at the local level. While there will be no fund flow to the commune level, the councils will each chair a local commune committee (described below) that will, *inter alia*, support the organization of communities, facilitate the construction works, and act as a first point of contact for community members to engage with the project (including offering a possible channel to discuss potential grievances).



**Figure 12** “Structure of the Provincial Halls”

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56 Ministry of Interior (2008), *Situational Analysis of Provincial/Municipal and District/Khan Administration in Cambodia*, p8

57 Note that this is a generic structure. While the Provincial Administration Unit/Office is present in every provinces, some of the other offices may differ from province to province

**Table 18**

***Project Execution Responsibilities***

<b>Output</b>	<b>Executing Entity</b>	<b>Executing Partner</b>
<b>Output 1.1.</b> Community capacity built to collect and manage solid waste	NCSD	Provincial Department of Environment, Kep and Preah Sihanouk Provinces
<b>Output 1.2.</b> Communities in target areas have been trained on resilient house construction techniques	NCSD	Provincial Department of Land Management, Urban Planning and Construction, Kep and Preah Sihanouk Provinces
<b>Output 1.3.</b> Communities have been organised to manage, monitor and maintain the infrastructure investments under Component 3	NCSD	Provincial Halls of both provinces, NCDD, Department of Planning
<b>Output 2.1.</b> Government officers at the provincial and districts/cities trained to plan effectively for sustaining and enhancing the project’s adaptation benefits	NCSD	Provincial Halls of both Provinces, Department of Environment, Department of Planning, NCDD (both provinces)
<b>Output 2.2.</b> Government officers at the provincial and district provided with comprehensive technical training to manage, operate and maintain the infrastructure	NCSD	Provincial Halls, Department of Water Resources and Meteorology, Department of Land Management, Urban Planning and Construction, Department of Environment, Fisheries Administration (both provinces for all departments)
<b>Output 2.3.</b> Institutional systems strengthened to monitor adaptation investments and replicate their benefits	NCSD	Provincial Halls, NCDD, Department of Planning (both provinces)
<b>Output 3.1.</b> 285ha of Mangroves restored in Kep City and Angkaol Communes, Kep Province	NCSD	Fisheries Administration
<b>Output 3.2</b> Water gates repaired in 3 locations in Pong Teuk and Angkaol	NCSD	Department of Water Resources and Meteorology, Kep Province

2 canals rehabilitated in Pong Teuk and Angkaol Communes, Kep Province		
<b>Output 3.3</b> Prevention of salt water ingress through improved channels	NCSD	Department of Water Resources and Meteorology, Kep Province
<b>Output 3.4</b> O Thmar Reservoir rehabilitated to increase water storage capability Kep Province	NCSD	Department of Water Resources and Meteorology, Kep Province
<b>Output 3.5</b> Resilient Housing designs developed and demonstrations constructed (both provinces)	NCSD	Department of Land Management, Urban Planning and Construction, Kep and Preah Sihanouk Provinces
<b>Output 3.6</b> Raised embankment and Watergate repair in Ou Ohkna Heng Commune, P. Sihanouk Province.	NCSD	Department of Water Resources and Meteorology, Preah Sihanouk Province
<b>Output 3.7</b> Drainage and Rainwater Harvesting installed at Veal Rinh Market, P. Sihanouk Province	NCSD	Department of Land Management, Urban Planning and Construction, Preah Sihanouk Provinces
<b>Output 3.8</b> Tide gauge with early warning system broadcast capabilities installed (Tide Gauge in Ou Okhna Heng Commune, Prey Nob District	NCSD	Department of Water Resources and Meteorology, Preah Sihanouk Province

UN-Habitat is the multilateral implementing entity (MIE) and will provide project management support, oversight and will act as the secretariat of the Project Management Committee. It will also be part of the team that implements the project, where it will provide technical knowledge and expertise based on its experience implementing other climate change projects in Cambodia and the Asia-Pacific region. The agency will further oversee compliance with its Environmental and Social Safeguard System and the Environmental and Social Safeguard Policy of the Adaptation Fund.

### **Legal and Financial Arrangements**

UN-Habitat and the National Council for Sustainable Development (NCSD) will sign a joint Memorandum of Understanding (MoU) as a legal commitment to implement the project.

UN-Habitat will enter into an Agreement of Cooperation with NCSD. This is the legal basis to transfer funds to be invested under the project. This agreement will be reviewed by the PMC and will specify in significant detail the activities to be implemented by the project, the timeframe and the deliverables required.

The Permanent Secretary, NCS, will authorize the payments against the contractual agreements, upon recommendations from the project manager. The Director of the Climate Change Department, as well as the UN-Habitat Programme Manager for Cambodia will provide an advisory function.

### **Project Governance**

At the national level, the Project will be supported by a **Project Management Committee (PMC)**. The PMC will be formed to oversee and keep abreast of project progress and facilitate the implementation of the project, including overseeing and cooperating with the project team, the technical advisory group, the local steering committees and the project oversight group.

The PMC will be chaired by the Secretary General, NCS, and vice-chaired by Governors of Kep and Preah Sihanouk Provinces, or their appointed deputies. UN-Habitat will provide the secretariat function of the PMC. A representative of the UN-Habitat Regional Office for Asia and the Pacific will also be a member of the PMC. Other members of the PMC will be representatives of the following; the NCS, the Climate Change Department, MoE, working-level representatives of the Provincial Governments of Preah Sihanouk Province and Kep Province, the Ministry of Water Resources and Meteorology, the Fisheries Administration, the Ministry of Women's Affairs and Ministry of Land Management, Urban Planning and Construction. Observer members of the committee will be representatives of the UN Capital Development Fund and the Global Green Growth Institute.

The PMC will: (1) approve annual work plans and review key project periodical reports; (2) will review and approve the contractual agreements, including workplans, with a particular emphasis on environmental and social safeguards, budgets and payment schedules; (3) review any deviations and consider amendments to workplans and contractual arrangements.

The PMC will meet at least once per year throughout the project implementation and whenever needed to fulfil the above functions. The PMC will also convene *ad hoc* meetings to address serious Environmental and Social safeguard risks, if these arise. At least 30% of committee members will be women, and the Ministry of Women's Affairs will be a member of the PMC. This is designed to ensure female representation at the decision-making heart of the project.

**Project Oversight**, will be incorporated into the core function of the PMC (rather than being a separate oversight body), is led by the responsible officer in UN-Habitat's Regional Office for Asia and the Pacific (ROAP) under the guidance of the Regional Director and supported by Project Management Officers (financial management and administration) and UN-Habitat's Headquarters (HQ) Monitoring and Evaluation Unit, the Programme Division including the Climate Change Planning Unit, and the External Relations Division, in particular the Advocacy, Outreach and Communications will ensure project management compliance in accordance with UN-Habitat and AF standards and requirements.

The national level **Project Team** will be comprised of the Project Manager (who will be recruited by the Ministry of Environment), the Director of the Department of Climate Change, the Director of Marine and Coastal Conservation, and the Administration Unit, MoE. The Project Team will be responsible for managing project activities and ensuring compliance with all commitments contained in this project document, such as the 15 Environmental and Social Safeguards Principles of the Adaptation Fund, the Environmental and Social Management Plan (see [Part III. Section E](#) for the results framework, [Annex 3](#) for the ESMP), as well as providing day-to-day support to the executing entity. The Project Team will also take the lead in monitoring through periodic visits to the intervention sites, and generating learning from the project. The Project Team will develop a Monitoring and Evaluation Plan during the project's inception phase, which will be distributed to targeted stakeholders, and reported to the PMC.



There will then be a **Project Execution Unit** in each province (2x PEUs in total), which will be located in Provincial Hall. The Provincial Execution Unit will be chaired by the Deputy Governor of Kep and Preah Sihanouk Provinces. This unit will include a provincial level coordinator who will oversee the day-to-day running of each activities underway in each respective province. The project execution will also count on representation from the following offices at the subnational level; Provincial Hall, the Provincial Departments of Environment; Water Resources and Meteorology; Land Management, Urban Planning and Construction, the Fisheries Administration, Women’s Affairs and representatives from each of the municipalities and districts in the project (there is 1 target municipality and 1 target district in Kep, and 1 target district in Preah Sihanouk Province). The provincial execution unit will target 30% female representation, and include representation from the Provincial Department of Women’s Affairs.

At the community Level, representatives of each elected commune council will form a **Local Commune Committee** with district officials and community representatives themselves. The local commune committee will be guide the investment activities in the target areas, as well as take a role in oversight, especially with regard to emerging environmental and social risks. As people on this committee are the closest to the beneficiaries and the field sites, they will be best-placed to review any breaches of the project’s environmental and social safeguard system, and to flag any risks.

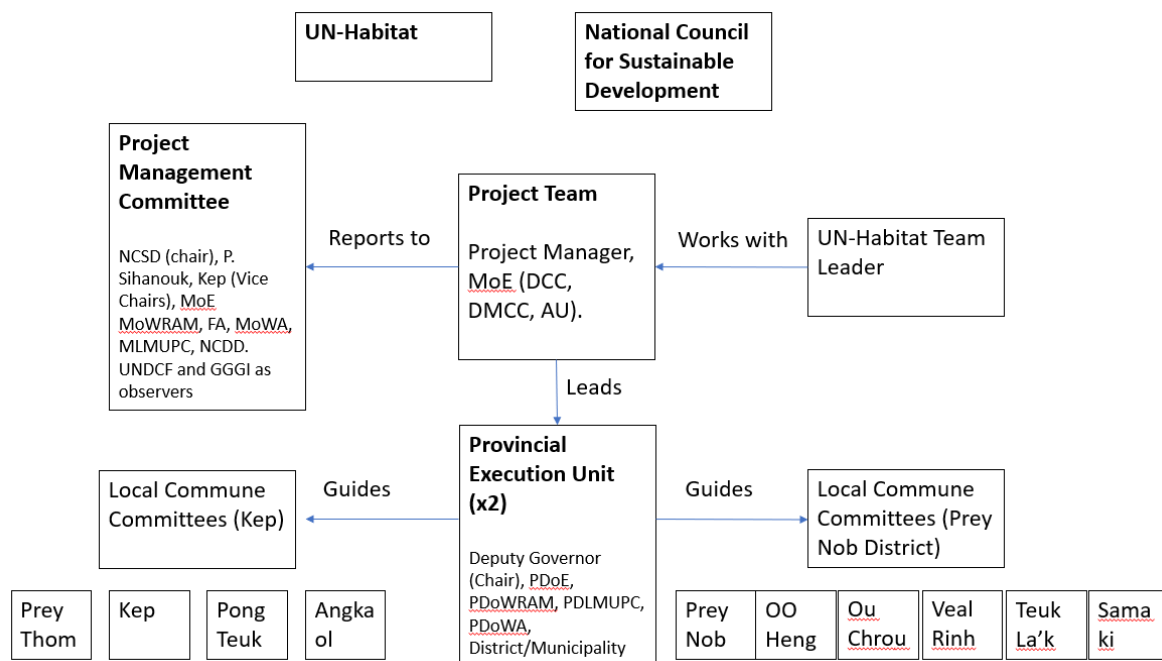


Figure 1 - Organigram of the Project

## B. MEASURES FOR FINANCIAL AND PROJECT RISK MANAGEMENT

The status of financial and project risks, including those measures required to avoid, minimize, or mitigate these risks, will be monitored throughout the project (as discussed in Section D: arrangements for monitoring, reporting and evaluation).

**Table 19**

*Financial and project management risks, significance of risks and measures to manage/mitigate risks.*

	Category and Risk	Rating: Impact/Probability 1: Low 5: High	Management/Mitigation Measure
1.	Environmental/ social: Current climate and seasonal variability and/or hazard events result in infrastructure construction delays or undermine confidence in adaptation measures by local communities	Impact: 3 Prob: 2	<ul style="list-style-type: none"> <li>• Current climatic variability has been taken into account in the planning and design of project activities and especially into Component 3: The detailed project sheets in <a href="#">Annex 2</a> identify where physical works need to take place during the dry season, for example</li> <li>• All selected investments under Component 3 have been extensively consulted with communities, local elected officials, government staff at the sub-national and national level and with other organisations working in the target area.</li> </ul>
2.	Institutional: Loss of government support (at all levels) for the project (activities and outputs) may result in lack of prioritization of AF project activities.	Impact: 4 Prob: 1	<ul style="list-style-type: none"> <li>• Establishment of a project management committee and the overall participatory and inclusive project design will improve national, municipal and beneficiary level ownership throughout and thus enhance government support for project implementation.</li> <li>• UN-Habitat will enter into legal agreements (MoUs and AoCs) with the NCSD to ensure that the executing partners will deliver project activities and outputs.</li> <li>• Government staff working on climate change, environment, disaster management, land use and housing will be strongly integrated into the project's structure (<a href="#">see Part III, Section A</a>)</li> </ul>

			<ul style="list-style-type: none"> <li>In the fallout from the 2018 election, the position of the NCDD has been weakened in Cambodia, which is why the organisation plays a diminished role compared to the previous version of the proposal. The project design, and particularly its management arrangements now have a robust structure, as there will not be a national election until 2023. However, there will be a commune election in 2021, which could affect some locally elected representatives. However, the structure of the local committees is such that they also include both government staff and community members, which is partly designed to ensure continuity, in the event of a change of personnel at the commune level.</li> </ul>
3.	Institutional: Capacity constraints of local institutions may limit the effective implementation of interventions	Impact: 2 Prob: 1	<ul style="list-style-type: none"> <li>The project has a strong capacity building and training component, designed to promote effectiveness and sustainability at the community, district and provincial government levels as part of Components 1&amp;2</li> </ul>
4.	Institutional/social Lack of commitment/buy-in from local communities may result in delay at intervention sites.	Impact: 2 Prob: 1	<ul style="list-style-type: none"> <li>Community stakeholders have been consulted during the full project development phase to ensure their buy-in into the AF project.</li> <li>A bottom-up approach integrating the community into the AF project's implementation phases – including community contracting - will be followed.</li> <li>Where possible, the community will have an active role through the 'People's Process' that ensures ownership of the project particularly through community participation in project implementation and monitoring</li> </ul>
5.	Institutional/social: Disagreement amongst stakeholders with regards to adaptation measures (infrastructure) and site selection.	Impact: 3 Prob: 2	<ul style="list-style-type: none"> <li>Adaptation measures and locations have been selected using extensive and detailed criteria, and through several rounds of in-depth consultation</li> <li>There will be a participatory approach to the construction of the infrastructure to be built under Component 3, through the <a href="#">People's Process</a></li> </ul>
6.	Institutional: Communities may not adopt activities during or after the AF project,	Impact: 2 Prob: 2	<ul style="list-style-type: none"> <li>The interventions will be institutionalized within the ministries, local government and communities to ensure sustainable delivery of (post-) project implementation, including formal agreements for</li> </ul>

	including infrastructure maintenance		<p>infrastructure maintenance (at national level) and O&amp;M structures at the sub-national level. Given the commitment of the national government and the policy alignment of this project, and the direct reporting mechanisms of local government to national government, it can be assumed that such agreements will be honoured.</p> <ul style="list-style-type: none"> <li>• Officials of sub-national (provincial, district/municipality and commune/sangkat) level will support the participating communities beyond the project implementation ensuring community level governance support as well as support for maintenance.</li> <li>• Capacity building and training of communities will be undertaken to improve their awareness and understanding of the benefits of the activities, including infrastructure maintenance (Component 1).</li> <li>• Communities will be involved in project implementation/decision making throughout the project. Communities will have a stake in the construction, operation and maintenance of the infrastructure (Capacity building under Component 1, construction under Component 3)</li> </ul>
7.	<p>Financial:</p> <p>Complexity of financial management and procurement. Certain administrative processes could delay the project execution or could lack integrity</p>	<p>Impact: 3 Prob: 2</p>	<ul style="list-style-type: none"> <li>• Financial management arrangements have been defined during project preparation.</li> <li>• UN-Habitat’s control framework, under the financial rules and regulations of the UN secretariat, will ensure documentation of clearly defined roles and responsibilities for management, internal auditors, the governing body, other personnel and demonstrates prove of payment / disbursement.</li> <li>• Procurement will be done by the NCS D as agreed in the Agreement of Cooperation. The project manager and the project team have a certifying role (for key procurements / expenditures). All expenditures/costs/payments will be paid in USD. In Cambodia, US\$ is used for the procurement of goods and services (including salaries). Hence, there is no risk of exchange rate fluctuation.</li> </ul>
8.	<p>Institutional:</p> <p>Delays in project</p>	<p>Impact: 1 Prob: 2</p>	<ul style="list-style-type: none"> <li>• The ownership by the Government has been high during the project preparation phase which will reduce this risk.</li> </ul>

	implementation, and particularly in the development of infrastructure interventions		<ul style="list-style-type: none"> <li>Partnerships with key government agencies and infrastructure and community resilience project planning will start early on – in tandem with the community action planning. Institutional arrangements will be put in place well before the finalization of community action plans.</li> <li>Lessons learned from other relevant projects (see <a href="#">Part II, Section F</a>), done by MoE and NCDD are incorporated in the project design.</li> </ul>
9.	<p>Institutional:</p> <p>A lack of coordination between and within national government Ministries and Departments.</p>	Impact: 1, Prob:2	<ul style="list-style-type: none"> <li>The Project Management Committee under the leadership of NCSD is to ensure coordination. Should UN-Habitat observe coordination problems, the agency will try to resolve issues directly with concerned parties and or the PMC.</li> </ul>
10.	<p>Legal</p> <p>Delays or barriers in gaining approval for infrastructure and housing due to delays in the development process or due to land tenure issues.</p>	Impact 4 Prob 1	<ul style="list-style-type: none"> <li>During the project preparation phase the proposed infrastructure identified is located on state public land. This means that conflicts over land tenure are not envisaged.</li> <li>The PMC and the LCC are tasked to ensure close collaboration with the provincial line departments of Environment, Water Resources and Meteorology, Land Management, Urban Planning and Construction and the Fisheries Administration</li> </ul>

## C. MEASURES FOR THE MANAGEMENT OF ENVIRONMENTAL AND SOCIAL RISKS

The proposed project seeks to fully align with the Adaptation Fund’s Environmental and Social Policy (ESP). For that purpose, environmental and social risks and impacts of the project and related activities need to be identified and addressed (so that the project does not unnecessarily harm the environment, public health or vulnerable communities). As described in Part II. Sections [E](#) and [K](#), systematic screening and assessment has been done based on broad consultation with national and local government stakeholders, a wide range of other concerned stakeholders and the target communities. The project design has benefitted from this process.

To ensure that remaining risks are well managed the project management and governance ([Part III. Section A](#)), Monitoring and Evaluation ([Part III. Section D](#)) fully take the management of environmental and social risks into account. In addition, and Environmental and Social Management Plan (ESMP) has been developed to ensure full compliance with the Adaptation Fund’s Environmental and Social and Gender Policies.

The ESMP for this project, detailed in [Annex 3](#) identifies measures and actions that reduce potentially adverse environmental and social impacts to acceptable levels. The plan includes compensatory measures, if applicable. Specifically, the ESMP”.

- (i) Identifies and summarizes all anticipated adverse environmental and social impacts in line with the Adaptation Fund’s ESP principles;
- (ii) Describes mitigation measures, both from the perspective of mitigating risks at each activity and from the perspective of upholding all ESP principles;
- (iii) Describes a process which supports the screening and assessment of all project activities and the conditions under which screening and mitigation action is required;
- (iv) Clearly assigns responsibilities for screening, assessment, mitigation actions and, approval and monitoring;
- (v) Takes into account, and is consistent with, other technical standards required for the project in particular those that relate to national law.

It should also be noted that each investment that forms a part of Component 3 has been designed to provide environmental and social benefits, based on the Environmental and Social Policy of the Adaptation Fund. A summary of the benefits, and how ESP principles has been incorporated into the design of the investments is included in each investment sheet, which can be found in [Annex 2](#).

For the activities under the three components of the project, the ESP will be upheld by ensuring that:

- (i) All MoUs and Agreements of Cooperation with the Executing Entity will include detailed reference to the ESMP and in particular the 15 ESP Principles.
- (ii) The ToR of Committees and Advisory Groups, project personnel and focal points will include detailed reference to the ESMP and in particular the 15 ESP Principles.
- (iii) The Executing Entity and other relevant government agencies will receive training / capacity development to understand the 15 Principles, the ESMP and in particular their responsibilities. This will include members of the Project Management Committee, the Local Commune Committees and the Communities.
- (iv) A Monitoring and Evaluation Framework will be developed by the project management team and presented for approval to the Project Management Committee.
- (v) All project monitoring will have the 15 environmental and social principles, and the ESMP Strategy mainstreamed into it. In addition to upholding the ESP of the Adaptation Fund and to familiarize all project stakeholders with the 15 ESP principles, this will also ensure that all stakeholders fully take ownership of the environmental and social safeguards procedures of the project and that any activity that may have been altered or not yet assessed in detail are captured.
- (vi) A grievance mechanism is also part of the plan. This will allow any affected stakeholder to raise concerns, anonymously if they wish, to the community leaders on the local coordinating committee, the project team or the PMC. The primary alternative means for affected beneficiaries and/or community members to raise grievances confidential telephone number<sup>58</sup>. In addition to the grievance mechanism, local staff will be trained to have an ‘open-door’ policy with communities, so that communities can discuss any aspect of the project at any time. This less formal mechanism will also enable project staff to listen to communities’ concerns or ideas and promote them in the implementation of the

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*58 Note that an address was considered. However, Cambodia does not have a reliably functional postal service and literacy rates are far from 100% across the beneficiary communities. Given that telephone penetration is significantly higher, and a far more frequently used and reliable means of communication, it was decided that this is the best confidential and private means to address grievances.*

project. More formal consultations and workshops held at local and national levels throughout the project implementation will also serve as a means for stakeholders to raise concerns or suggests with the project's implementation.

## **D. ARRANGEMENTS FOR MONITORING, REPORTING AND EVALUATION**

The AF project will comply with formal guidelines, protocols and toolkits issued by the AF, UN-Habitat and the Royal Government of Cambodia. Annex 5 defines a more detailed Monitoring and Evaluation Framework, in which the Monitoring and Evaluation (M&E) of progress in achieving project results will be based on targets and indicators established in the Project Results Framework (see also below). Besides that, the status of identified environmental and social risks, UN-Habitat's Environmental and Social Safeguard System and the ESMP, including those measures required to avoid, minimize, or mitigate environmental and social risks, will be monitored throughout the project (at the activity level and through annual project performance, mid-term and terminal reports). The same applies to financial and project management risks and mitigation measures. [Annex 4](#) further reflects the AoC-partner in charge monitoring activities and ensuring milestones.

### ***Monitoring and Evaluation Framework***

UN-Habitat will ensure the timeliness and quality of project implementation. The oversight and general guidance of the project will be provided by the Project Management Committee. UN-Habitat will ensure that the project team and the key national executing partners are fully briefed on the M&E requirements.

Audit of the project's financial management will follow UN finance regulations and rules and applicable audit policies.

The M&E plan will be implemented as proposed in the Table 20 below.

**Table 20**

*Monitoring and Evaluation Plan*

Type of M&E Activities	Responsible Parties	Time Frame	Reporting
Inception Workshop and Report	National Project Manager Project Management Committee UN-Habitat ROAP	Workshop: within first two months of start Report: within first quarter	Inception Report
Periodic status/ progress reports	National Project Manager	Quarterly	Quarterly Report
Final Evaluation	National Project Manager UN-Habitat ROAP Project Management Committee External Consultants <sup>[SEP]</sup>	Final: At least three months before the end of project implementation	Final Evaluation Report
Project Terminal Report	National Project Manager UN-Habitat ROAP Local consultant <sup>[SEP]</sup>	At least three months before the end of the project	Terminal Report
Audit	UN-Habitat ROAP National Project Manager	■ As per UN-Habitat regulations ■	Audit Reports
Community consultations / workshops / training	National Project Manager	Within one week after each event	Documentation
Visits to field sites	UN-Habitat ROAP <sup>[SEP]</sup> Project Management Committee Government representatives <sup>[SEP]</sup>	Every six months	Field Report

For the M&E budget and a breakdown of how implementing entity fees will be utilized in the supervision of the M&E function, please see the detailed budget ([Part III, Section G](#)). For related data, targets and indicators, please see the project proposal results framework ([Part III, Section E](#)).

**Participatory monitoring** mechanisms (involving different levels of government and communes) will be put in place for the collection and recording of data to support the M&E of indicators. The project



formulation has gathered demographic data (some of which is in this public domain) and generated maps through Google Maps and Google Earth, which will be handed over to the PMC for use in the project, including in monitoring.

The communes will be involved in further data collection and in community consultations in data analysis. This will allow beneficiary communes to work directly with the project's M&E mechanism, to highlight issues in project delivery and to strengthen adaptation benefits, including in replication and sustaining the project's gains. Data collected will include marginalized groups (e.g. women) aggregated (if possible). Project site visits will be jointly conducted based on an agreed schedule to assess project progress first hand.

The Project Manager will develop an **M&E Plan** during the project's inception phase, which will be distributed and presented to all stakeholders during the initial workshop. The emphasis of the M&E plan will be on (participatory) outcome/result monitoring, project risks (financial & project management risks and environmental social safeguard risks) and learning and sustainability of the project. Periodic monitoring will be conducted through visits to the intervention sites.

UN-Habitat will ensure that all executing partners are fully briefed on the M&E requirements to ensure that baseline and progress data is fully collected and that a connection between the Knowledge Management component and M&E is established. The Agreement of Cooperation will also reflect these.

**An Annual Project Performance Review (PPR)** will be prepared to monitor progress made since the project's start and in particular for the previous reporting period. The PPR includes, but is not limited to, reporting on the following:

- Progress on the project's objective and outcomes – each with indicators, baseline data and end of project targets (cumulative);
- Project outputs delivered per project outcome (annual);
- Lessons learned/good practice;
- Annual Work Plan and expenditure;
- Annual management;
- Environmental and social risks (i.e. status of implementation of ESMP, including those measures required to avoid, minimize, or mitigate environmental and social risks. The reports shall also include, if necessary, a description of any corrective actions that are deemed necessary;
- Project financial and management risks (same as per above).

The **reports** that will be prepared specifically in the context of the M&E plan are:

- (i) **the M&E plan,**
- (ii) **the project inception report,**
- (iii) **the Annual-, and terminal project performance reports and**
- (iv) **the technical reports.**

For the M&E budget and a breakdown of how implementing entity fees will be utilized in the supervision of the M&E function, please see the detailed budget ([Part III. Section G](#)). For related data, targets and indicators, please see the project proposal results framework ([Part III, Section E](#)).

## E. PROJECT PROPOSAL RESULTS FRAMEWORK

**Table 21**

*Project Results Framework*

Expected Result	Indicators	Baseline Data	Targets	Risks & Assumptions	Data Collection Method	Frequency	Responsibility
<p><b>Project objective:</b> enhance the climate and disaster resilience of the most vulnerable coastal human settlements of Cambodia through concrete adaptation actions, particularly in areas where eco-tourism has the potential to sustain such interventions.</p>							
<p><b>Project component 1:</b> community-scale knowledge and capacity enhanced to sustain the adaptation benefits of the project’s investments</p>							
<p><b>Outcome 1</b></p> <p>Community-scale knowledge and capacity enhanced to sustain the adaptation benefits of the project’s investments</p>	<p>Level of knowledge capacity at the community increased, measured by the number of community groups performing basic maintenance, clean-ups or</p>	<p>Communities in the target area are not organised to manage or maintain infrastructure, collect solid waste or repair houses</p>	<p>At least one community group per investment and one group per commune formed and functional, performing these tasks</p>	<p>R Migration and/or rapid development makes it difficult to sustain these community groups</p> <p>A People will continue to be willing to take responsibility for management,</p>	<p>Commune-level data gathering</p>	<p>Baseline, mid-term and end</p>	<p>UN-Habitat and executing entity, with support from target commune councils</p>

	house maintenance			maintenance and clean-up			
<b>Output 1.1.</b> Community capacity built to collect and manage solid waste	No. and type of trainings conducted to strengthen capacity on solid waste management	No training has been conducted on solid waste management, and solid waste is a critical factor in preventing the functionality of critical infrastructure	2x trainings per commune completed	R – Communities ignore the training they have been given  A – Improved solid waste management will play a critical role in the continued functionality of infrastructure	Training reports	Baseline, mid-term and end	UN-Habitat and Executing entity
<b>Output 1.2.</b> Communities in target areas have been trained on resilient house construction techniques	No. of people trained on resilient house construction techniques	There are few if any local carpenters that have sufficient capacity to build resilient houses	200 people (with equal gender balance) trained	R Carpenters take their new skills elsewhere, seeking greater economic opportunities  A People will actually utilise the skills they gain in house construction (Rather than reverting to traditional practices)	Training reports	Baseline, mid-term and end	UN-Habitat and Executing entity

<p><b>Output 1.3.</b></p> <p>Communities have been organised to manage, monitor and maintain the infrastructure investments under Component 3</p>	<p>No. of trainings provided to communities on managing, monitoring and maintaining infrastructure investments</p>	<p>Communities have not received training of infrastructure management, monitoring and maintenance and are unaware of the need and approaches</p>	<p>8 Training clusters implemented</p>	<p>R – Limited technical capability to maintain infrastructure</p> <p>A – Sufficient maintenance can be undertaken without specialist equipment or knowledge</p>	<p>Training reports</p>	<p>Baseline, mid-term and end</p>	<p>UN-Habitat and Executing entity</p>
<p><b>Activities</b></p> <p>1.1.1 Define trainee group</p> <p>1.1.2 Baseline knowledge/training needs assessment</p> <p>1.1.3 Define/prepare training materials</p> <p>1.1.4 Give trainings</p> <p>1.1.5 Monitor</p> <p>1.2.1 Define trainee group (note that these will be different from Output 1.1)</p> <p>1.2.2 Baseline knowledge/training needs assessment</p> <p>1.2.3 Define/prepare training materials</p> <p>1.2.4 Give trainings</p> <p>1.2.5 Monitor</p> <p>1.3.1 Define community members who will lead</p> <p>1.3.2 Baseline knowledge/training needs assessment</p> <p>1.3.3 Develop training materials</p> <p>1.3.4 Organise community-scale committees</p>				<p><b>Milestones</b></p> <ul style="list-style-type: none"> <li>▪ All trainees defined by month 6</li> <li>▪ All baseline knowledge/training needs assessments completed by month 12</li> <li>▪ All training materials prepared by month 15</li> <li>▪ All trainings complete between months 15-36</li> <li>▪ All monitoring of training complete by month 42</li> </ul>			

**Project Component 2: Government planning and technical capacity enhanced to sustain and enhance the project's adaptation benefits**

<b>Outcome 2</b>  Government planning and technical capacity enhanced to sustain and enhance the project's adaptation benefits	Level of capacity at the sub-national level increased, measured by the number of adaptation actions planned in the target area	Capacity is limited, especially outside the national level. It is unclear if any adaptation projects have been planned	5 projects prepared and planned for through the government system that enhance this project's adaptation benefits, and extend climate change adaptation to a greater number of people in the target area	R. Political issues change the nature of the planning system  A. There is continued broad support for climate change adaptation, politically	Review of planning	Baseline, mid-term and end	Executing entity
<b>Output 2.1.</b>  Government officers at the provincial and districts/cities trained to plan effectively for sustaining and	No. of government staff trained	There is constrained capacity (both in terms of manpower and technical know-how) to plan for the replication and upscaling of	60 government officers trained	R. Changing priorities in the planning system result in adaptation getting lower priority	Training reports	Baseline, mid-term and end	Executing entity and UN-Habitat

enhancing the project's adaptation benefits		climate change actions		A. Continued willingness exists to plan for and implement climate change adaptation			
<b>Output 2.2.</b> Government officers at the provincial and district provided with comprehensive technical training to manage, operate and maintain the infrastructure	No. of government staff trained	There is constrained capacity (both in terms of manpower and technical know-how) to manage, operate and maintain infrastructure	25 government officers trained	R. Staff move on to new posts, once trained  A. Staff will remain in place to be able to implement the training	Training reports	Baseline, mid-term and end	UN-Habitat and Executing entity
<b>Output 2.3.</b> Institutional systems strengthened to monitor adaptation investments and replicate their benefits	No. of monitoring systems in place	There is currently no systematic way to review 'what works' in terms of climate change adaptation and to upscale its benefits	A system in place to systematically monitor adaptation investments and plan and advocate for replication,	R. Changing priorities in the planning system result in adaptation getting lower priority  A. Continued willingness exists	Institutional review report	Baseline, mid-term and end	UN-Habitat and Executing entity

			upscaling and further funding	to plan for and implement climate change adaptation			
<b>Activities</b> 2.1.1 Define trainee group 2.1.2 Baseline knowledge/training needs assessment 2.1.3 Define/prepare training materials 2.1.4 Give trainings 2.1.5 Monitor  2.2.1 Define trainee group (note that these are different from Output 2.1) 2.2.2 Baseline knowledge/training needs assessment 2.2.3 Define/prepare training materials 2.2.4 Give trainings 2.2.5 Monitor  2.1.1 Perform institutional review 2.1.2 Make recommendations 2.1.3 Train appropriate range of officers 2.1.4 Highlight best practices and integrate into plans 2.1.5 Write case studies				<b>Milestones</b> <ul style="list-style-type: none"> <li>▪ All trainees defined by month 6</li> <li>▪ All baseline knowledge/training needs assessments completed by month 12</li> <li>▪ All training materials prepared by month 15</li> <li>▪ All trainings complete between months 15-36</li> <li>▪ All monitoring of training complete by month 42</li>   <li>▪ Institutional review complete by month 12</li> <li>▪ Training conducted by month 18</li> <li>▪ Plans updated by month 36</li> <li>▪ Case studies complete before month 48</li> </ul>			

<b>Project component 3: Resilience built through investment in small-scale protective and basic service infrastructure and natural assets</b>							
<b>Outcome 3</b>	No of people that benefit from climate change resilient infrastructure, access to natural assets	62,521 people have been assessed as vulnerable to climate change impacts	100% of the vulnerable population (62,521 people) of which at least 50 percent	R – Delay in implementing infrastructure  A – Agreement of Cooperation will	Field site inspections photo documentation and	Baseline, mid-term and end	UN-Habitat

protective and basic service infrastructure and natural assets	and improved livelihood options to withstand conditions resulting from climate variability and change		women have access to resilient infrastructure and/or protective natural assets	stipulate timeframe for implementing infrastructure	data base and geo-tacked community monitoring report		
<b>Output 3.1.</b> 285ha of Mangroves restored in Kep City and Angkaol Communes, Kep Province and Prey Nob Commne, Prey Nob District	No. of people who benefit from the restored mangrove	Approximately 1140ha of land is vulnerable to coastal flooding, erosion, and salt-water incursion	This land and 17,754 people have greater protection from coastal flooding, erosion and salt-water incursion.  There will be \$600 benefit to fishermen per hectare of mangrove planted	R – Plantation Failure, illegal cutting  A – Full buy-in from local communities who understand the long-term benefits of mangroves	MPMP and monitoring reports	Baseline, mid-term and end	UN-Habitat
<b>Activities</b> 3.1.1 Site reconfirmation and finalisation 3.1.2 Develop and finalise the Mangrove Planting and Management Plan (MPMP) 3.1.3 Approve the MPMP 3.1.4 Plant the mangroves				<b>Milestones</b> <ul style="list-style-type: none"> <li>• MPMP complete and approved (month 9)</li> <li>• Plantation underway (Month 12)</li> <li>• Plantation complete (Month 24)</li> </ul>			



3.1.5 Monitor the progress of the mangrove areas and highlight any problems

For a more detailed description of the activities, see Project sheet 3.1, [Annex 2](#).

<p><b>Output 3.2a</b> Water gates repaired in 3 locations in Pong Teuk and Angkaol</p> <p><b>Output 3.2b</b> Canals Rehabilitated in Pong Teuk and Angkaol Communes</p>	<p>No. of people who benefit from the repaired water gates and rehabilitated canals</p>	<p>Water shortages arising from inadequate water management</p>	<p>1960ha of paddy with greater water access.</p> <p>Increased rice yield for agricultural families, and water access for non-agri families</p> <p>A total of 19,553 people benefit</p>	<p>R – Solid waste decreases the effectiveness of the gates</p> <p>A – The training under Output 1.1 will be effective</p>	<p>Monitoring reports</p>	<p>Baseline, mid-term and end</p>	<p>UN-Habitat</p>
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Activities

3.2.1 a&b Reconfirm and design in further detail, based on technical drawings provided

3.2.2 Procure the necessary construction materials

3.2.3 Undertake the construction work during the dry season

For a more detailed description of the activities, see Project sheets 3.2a and 3.2b in [Annex 2](#)

Milestones

- Construction complete by month 18. Physical work on 3.2b to take place during the dry season

<b>Output 3.3</b> Prevention of salt water ingress through improved channels	No. of people who benefit from the rehabilitated canals	3,500 people in the target area lack basic water management infrastructure and suffer from salt water incursion	3,500 people will benefit	R. Inability to access the site  A. Sea-level rise will be within worst-case scenario projections. Continued cooperation to allow site access	Monitoring reports	Baseline, mid-term and end	UN-Habitat
<b>Activities</b> 3.3.1 Final re-confirmation on ESS, considering the need for an access road 3.3.2 Procurement of hardware 3.3.3 Site clearance and access road construction 3.3.4 Install gates and embankments  For a more detailed description of the activities, see Project sheet 3.3 in <a href="#">Annex 2</a>				<b>Milestones</b> <ul style="list-style-type: none"> <li>ESS reconfirmation complete by month 9</li> <li>Access road constructed by Month 18</li> <li>Activity complete by month 36</li> <li>Site restored to original state by month 42</li> </ul>			
<b>Output 3.4</b> O Thmar Reservoir rehabilitated to increase water storage capability Kep Province  <b>Output 3.4b</b> Rones reservoir	No. of people who have improved access to water  No. of ha land protected	14,060 people have unreliable access to water, are vulnerable to poor conditions or the reservoir, and rely on rainfed agriculture	14,060 will have year-round access to water, even during especially dry years, 600ha of rice paddy will be irrigated	R. A contractor with sufficient technical capability cannot be found  A. A pontoon suitable for dredging (see project sheet) can be found	Monitoring reports	Baseline, mid-term and end	UN-Habitat

rehabilitated for enhanced safety and storage							
<b>Activities</b> 3.4.1 Clear the site 3.4.2 Confirm (through survey if necessary) that the site is clear on UXO 3.4.3 Procure the necessary hardware 3.4.4 Undertake excavation work				<b>Milestones</b> <ul style="list-style-type: none"> <li>• UXO clearance report complete by month 6)</li> <li>• Excavation begins by month 12</li> <li>• Complete by month 36</li> </ul>			
<b>Output 3.5</b> Resilient Housing designs developed and demonstrations constructed (both provinces)	No. of locally appropriate housing designs developed  No. of demo houses constructed	Up to 200 houses per commune are destroyed or severely damaged by strong winds every year  Houses are not well constructed and use poor materials	9,720 people benefit from design, training and 4 demo houses built	R. people don't utilise the training in their own houses/future construction/repairs  A. People will use their skills productively, will remain in the area and will reconstruct their houses	Monitoring reports	Baseline, mid-term and end	UN-Habitat
<b>Activities</b> 3.5.1 Develop in greater detail demo house drawings 3.5.2 Select training beneficiaries considering age, gender and location 3.5.3 Run educational programmes/courses for trainees 3.5.4 Construct demo houses with trainees				<b>Milestones</b> <ul style="list-style-type: none"> <li>• Detailed designs complete by month 12</li> <li>• Courses and demo houses complete in all communes by month 36</li> </ul>			

<b>Output 3.6</b> Raised embankment and Watergate repair in Ou Ohkna Heng Commune, P. Sihanouk Province.	No of people whose land is protected from salt water incursion  No. of ha of land protected	The land-side of the embankment and water gates is severely affected by salt water, meaning that rice paddies are unproductive and surface water used for drinking is unusable	20,000 people in the area (of a total population of 27,667) and 2,000ha of rice fields protected	R. Access to the site will not be possible in the rainy season, due to the existing quality of the access road and the nature of the equipment that needs to travel down it  A. Sea-level rise will be within worst-case scenario projections.	Monitoring reports	Baseline, mid-term and end	UN-Habitat
<b>Activities</b> 3.6.1 Topographic survey 3.6.2 Geotechnical survey 3.6.3 Install new gates and fill areas				<b>Milestones</b> <ul style="list-style-type: none"> <li>• Topographic and geotechnical surveys complete by month 18</li> <li>• New gates installed by month 24</li> <li>• Areas filled and works complete by month 36</li> </ul>			
<b>Output 3.7</b> Drainage and Rainwater Harvesting installed at Veal Rinh Market, P. Sihanouk Province	The number of days' income lost to flooding events	The market floods every time there is heavy rain. Sellers lost around 30 days' income per year as a result	The market retains 365 day per year functionality, not losing any days to heavy rainfall.	R. Sellers will be impacted while the works are ongoing  A. The market can continue its functionality throughout the	Monitoring reports	Baseline, mid-term and end	UN-Habitat

			<p>The market has access to harvested rainwater</p> <p>4,500 people have improved year-round income</p>	<p>adaptation works, and that the incomes of those who derive their livelihood there will not be affected</p>			
<p><b>Activities</b></p> <p>3.7.1 Re-consult the sellers and the owner with a view to minimising risks and disruption arising from the works</p> <p>3.7.2 Procure all necessary materials</p> <p>3.7.3 Undertake works</p> <p>3.7.4 Specific training for market vendors and residents</p> <p>3.7.5 Develop a best-practice case study</p>				<p><b>Milestones</b></p> <ul style="list-style-type: none"> <li>• Re-consultations complete by month 9</li> <li>• Works underway by month 12</li> <li>• Works Complete by month 36</li> <li>• Final training and best-practice case study complete by month 42</li> </ul>			
<p><b>Output 3.8</b></p> <p>Tide gauge with early warning system broadcast capabilities installed (Tide Gauge in Ou Okhna Heng Commune, Prey Nib District</p>	<p>No. of people who have improved access to tidal information and early warning</p>	<p>There is no accurate or local tidal information provided to people, and no early warning system</p>	<p>An estimated 30,000 people have access to early warnings. Tidal information is also available to the local government and beneficiaries in the coastal area.</p>	<p>R. People will have adapted to not having weather information, and may not heed warnings provided</p> <p>A. Information can be provided to people in a timely manner</p>	<p>Monitoring reports</p>	<p>Baseline, mid-term and end</p>	<p>UN-Habitat</p>

Activities  
 3.8.1 – Import the tide gauge  
 3.8.2 – installation of tide gauge and integration with other PoWRAM systems  
 3.8.3 – Training for PoWRAM and other related officials.

Milestones  
 Tide Gauge in-country by month 18  
 Training complete by month 24  
 Fully operational by month 30

**Table 22**

*Activities and Milestones*

OUTPUT	YEAR 1				YEAR 2				YEAR 3				YEAR 4			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
<b>Output 1.1.</b> Community capacity built to collect and manage solid waste		X		X	X							X				X
<b>Output 1.2.</b> Communities in target areas have been trained on resilient house construction techniques		X		X	X							X				X
<b>Output 1.3.</b> Communities have been organised to manage, monitor and maintain the infrastructure investments under Component 3		X		X	X							X				X
<b>Output 2.1.</b> Government officers at the provincial and districts/cities trained to plan effectively for sustaining and enhancing the project’s adaptation benefits		X		X	X							X				X

<b>Output 2.2.</b> Government officers at the provincial and district provided with comprehensive technical training to manage, operate and maintain the infrastructure	X	X	X			X	X
<b>Output 2.3.</b> Institutional systems strengthened to monitor adaptation investments and replicate their benefits		X	X			X	X
<b>Output 3.1.</b> 285ha of Mangroves restored in Kep City and Angkaol Communes, Kep Province	X	X			X		
<b>Output 3.2</b> Water gates repaired in 3 locations in Pong Teuk and Angkaol (a)				X			
Canals Rehabilitated in Pong Teuk and Angkaol Communes (b)							
<b>Output 3.3</b> Prevention of salt water ingress through improved channels	X			X		X	X
<b>Output 3.4</b> O Thmar Reservoir rehabilitated to increase water storage capability Kep Province		X			X	X	X
<b>Output 3.5</b> Resilient Housing designs developed and demonstrations constructed (both provinces)		X				X	
<b>Output 3.6</b> Raised embankment and Watergate repair in Ou Ohkna Heng Commune, P. Sihanouk Province.				X	X	X	
<b>Output 3.7</b>	X	X				X	X

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Drainage and Rainwater Harvesting installed  
at Veal Rinh Market, P. Sihanouk Province

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**Output 3.8**

Tide gauge with early warning system  
broadcast capabilities installed (Tide Gauge in  
Ou Okhna Heng Commune, Prey Nob District

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X

X

X

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## F. PROJECT ALIGNMENT WITH THE ADAPTATION FUND RESULTS FRAMEWORK

**Table 23**

*Project alignment with the Adaptation Fund results framework*

Project Outcome	Project Outcome Indicator	Fund Outcome	Fund Outcome Indicator	Grant Amount (USD)
<b>Outcome 1</b> Community-scale knowledge and capacity enhanced to sustain the adaptation benefits of the project's investments	Level of knowledge capacity at the community increased, measured by the number of community groups performing basic maintenance, clean-ups or house maintenance	<b>Outcome 3:</b> Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	3.1. Percentage of targeted population aware of predicted adverse impacts of climate change, and of appropriate responses	<b>\$275,000</b>
<b>Outcome 2</b> Government planning and technical capacity enhanced to sustain and enhance the project's adaptation benefits	Level of capacity at the sub-national level increased, measured by the number of adaptation actions planned in the target area	<b>Outcome 2:</b> Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses	2.1. No. and type of targeted institutions with increased capacity to minimize exposure to climate variability risks	<b>\$275,000</b>

<p><b>Outcome 3</b></p> <p>Resilience built through investment in small-scale protective and basic service infrastructure and natural assets</p>	<p>No of people that benefit from climate change resilient infrastructure, access to natural assets and improved livelihood options to withstand conditions resulting from climate variability and change</p>	<p><b>Outcome 4:</b> Increased adaptive capacity within relevant development and natural resource sectors</p> <p><b>Outcome 5:</b> Increased ecosystem resilience in response to climate change and variability-induced stress</p> <p><b>Outcome 6:</b> Diversified and strengthened livelihoods and sources of income for vulnerable people in targeted areas</p>	<p>4.2. Physical infrastructure improved to withstand climate change and variability-induced stress</p> <p>5. Ecosystem services and natural assets maintained or improved under climate change and variability-induced stress</p> <p>6.1 Percentage of households and communities having more secure (increased) access to livelihood assets</p>	<p><b>\$3,620,507</b></p>
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Project Output	Project Output Indicator	Fund Output	Fund Output Indicator	Grant Amount (USD)
<b>Output 1.1.</b> Community capacity built to collect and manage solid waste	No. and type of trainings conducted to strengthen capacity on solid waste management	<b>Output 3:</b> Targeted population groups participating in adaptation and risk reduction awareness activities	3.1.1 No. and type of risk reduction actions or strategies introduced at local level	\$100,000
<b>Output 1.2.</b> Communities in target areas have been trained on resilient house construction techniques	No. of people trained on resilient house construction techniques	<b>Output 3:</b> Targeted population groups participating in adaptation and risk reduction awareness activities	3.1.1 No. and type of risk reduction actions or strategies introduced at local level	\$75,000
<b>Output 1.3.</b> Communities have been organised to manage, monitor and maintain the infrastructure investments under Component 3	No. of trainings provided to communities on managing, monitoring and maintaining infrastructure investments	<b>Output 2.2:</b> <i>Targeted population groups covered by adequate risk reduction systems</i>	2.2.1. Percentage of population covered by adequate risk-reduction systems	\$100,000
<b>Output 2.1.</b> Government officers at the provincial and districts/cities trained to plan effectively for sustaining and enhancing the project's adaptation benefits	No. of government staff trained	<b>Output 2.1:</b> Strengthened capacity of national and regional centres and networks to respond rapidly to extreme weather events	2.1.1. No. of staff trained to respond to, and mitigate impacts of, climate-related events	\$100,000

<b>Output 2.2.</b> Government officers at the provincial and district provided with comprehensive technical training to manage, operate and maintain the infrastructure	No. of government staff trained	<b>Output 2.1:</b> Strengthened capacity of national and regional centres and networks to respond rapidly to extreme weather events	2.1.1. No. of staff trained to respond to, and mitigate impacts of, climate-related events	\$100,000
<b>Output 2.3.</b> Institutional systems strengthened to monitor adaptation investments and replicate their benefits	No. of monitoring systems in place	<b>Output 2.2:</b> <i>Targeted population groups covered by adequate risk reduction systems</i>	2.1.2. Capacity of staff to respond to, and mitigate impacts of, climate-related events from targeted institutions increased	\$75,000
<b>Output 3.1.</b> 285ha of Mangroves restored in Kep City and Angkaol Communes, Kep Province	No. of people who benefit from the restored mangrove	<b>Output 5:</b> Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	5.1. No. and type of natural resource assets created, maintained or improved to withstand conditions resulting from climate variability and change (by type of assets)	\$208,704
<b>Output 3.2</b> Water gates repaired in 3 locations in Pong Teuk and Angkaol (a)  Canals Rehabilitated in Pong Teuk and Angkaol Communes (b)	No. of people who benefit from the repaired water gates and rehabilitated canals	<b>Output 6:</b> Targeted individual and community livelihood strategies strengthened in relation to climate change impacts, including variability	6.1.1.No. and type of adaptation assets (physical as well as knowledge) created in support of individual or	\$5,328 (a)  \$76,050 (b)

			community-livelihood strategies	
<b>Output 3.3</b> Prevention of salt water ingress through improved channels	No. of people who benefit from the rehabilitated canals	<b>Output 6:</b> Targeted individual and community livelihood strategies strengthened in relation to climate change impacts, including variability	6.1.1.No. and type of adaptation assets (physical as well as knowledge) created in support of individual or community-livelihood strategies	<b>\$246,000</b>
<b>Output 3.4</b> O Thmar Reservoir rehabilitated to increase water storage capability Kep Province  Bank strengthening work at Roness Reservoir to provide additional water retention and safety.	No. of people who have improved access to water  No. of ha land protected	<b>Output 5:</b> Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	5.1. No. and type of natural resource assets created, maintained or improved to withstand conditions resulting from climate variability and change (by type of assets)	<b>\$660,040</b>  <b>\$1,304,000</b>
<b>Output 3.5</b> Resilient Housing designs developed and demonstrations constructed (both provinces)	No. of locally appropriate housing designs developed  No. of demo houses constructed	<b>Output 6:</b> Targeted individual and community livelihood strategies strengthened in relation to climate change impacts, including variability	6.1.1.No. and type of adaptation assets (physical as well as knowledge) created in support of individual or	<b>\$89,000</b>

			community-livelihood strategies	
<b>Output 3.6</b> Raised embankment and Watergate repair in Ou Ohkna Heng Commune, P. Sihanouk Province.	No of people whose land is protected from salt	<b>Output 6:</b> Targeted individual and community livelihood strategies strengthened in relation to climate change impacts, including variability	6.1.1.No. and type of adaptation assets (physical as well as knowledge) created in support of individual or community-livelihood strategies	<b>\$266,100</b>
<b>Output 3.7</b> Drainage and Rainwater Harvesting installed at Veal Rinh Market, P. Sihanouk Province	The number of days' income lost to flooding events	<b>Output 6:</b> Targeted individual and community livelihood strategies strengthened in relation to climate change impacts, including variability	6.1.2. Type of income sources for households generated under climate change scenario	<b>\$712,905</b>
<b>Output 3.8</b> Tide gauge with early warning system broadcast capabilities installed Tide Gauge in Ou Ohkna Heng Commune, Prey Nob District	No. of people who have improved access to weather information and early warning	<b>Output 6:</b> Targeted individual and community livelihood strategies strengthened in relation to climate change impacts, including variability	6.1.1.No. and type of adaptation assets (physical as well as knowledge) created in support of individual or community-livelihood strategies	<b>\$52,380</b>

Adaptation Fund Core Indicators	Indicative Targets	Comments
1. Number of Beneficiaries	62,521	This only measures the beneficiaries of physical investments. It does not count the government officers trained by the project under Component 2
2. Early Warning Systems	1	There is no local early warning system in place, but local people receive warning of hazards from Ministry of Water Resources and Meteorology through TV, media and local authorities.
3. Assets Produced, Developed, Improved, or Strengthened	11 infrastructures	The investment sheets ( <a href="#">Part II, Section A</a> , and <a href="#">Annex 2</a> )
4. Increased income, or avoided decrease in income	4500 people will directly increase their income,  57,113 will indirectly increase their income	The 4500 people will benefit from the adaptation activities at Veal Rinh Market (output 3.7)  The 57,113 beneficiaries are the combined total of outputs 3.2 (a&b), 3.3, 3.4 and 3.6. The adaptation actions under these outputs will enable to increase their incomes through improved water management
5. Natural Assets Protected or Rehabilitated	285ha	The adaptation activities under output 3.1 will lead to the planting/replanting of 285ha of mangrove, protecting 1143ha of land and benefitting 17,754 people

## G. DETAILED BUDGET

Programme Component	Outputs	Activities	Total Budget	Year 1	Year 2	Year 3	Year 4
Community-scale knowledge and capacity enhanced to sustain the adaptation benefits of the project's investments	1.1. Community capacity built to collect and manage solid waste	1.1.1 Define trainee group	\$100,000	\$25,000	\$50,000	\$25,000	
		1.1.2 Baseline knowledge/training needs assessment					
		1.1.3 Define/prepare training materials					
		1.1.4 Give trainings					
		1.1.5 Monitor					
	1.2. Communities in target areas have been trained on resilient house construction techniques	1.2.1 Define trainee group	\$75,000	\$25,000	\$25,000	\$25,000	
		1.2.2 Baseline knowledge/training needs assessment					
		1.2.3 Define/prepare training materials					
		1.2.4 Give trainings					
1.2.5 Monitor							
1.3. Communities have been organised to manage, monitor and maintain the infrastructure investments	1.3.1 Define community members who will lead	\$100,000	\$25,000	\$50,000	\$25,000		
	1.3.2 Baseline knowledge/training needs assessment						
	1.3.3 Develop training materials						



	under Component 3	1.3.4 Organise community-scale committees 1.3.5 Monitor					
		<b>COMPONENT 1 TOTAL</b>	<b>\$275,000</b>	<b>\$75,000</b>	<b>\$125,000</b>	<b>\$75,000</b>	
Government planning and technical capacity enhanced to sustain and enhance the project's adaptation benefits	2.1. Government officers at the provincial and districts/cities trained to plan effectively for sustaining and enhancing the project's adaptation benefits	2.1.1 Define trainee group 2.1.2 Baseline knowledge/training needs assessment 2.1.3 Define/prepare training materials 2.1.4 Give trainings 2.1.5 Monitor	\$100,000	\$25,000	\$50,000	\$25,000	
	2.2. Government officers at the provincial and district provided with comprehensive technical training to manage, operate and maintain the infrastructure	2.2.1 Define trainee group 2.2.2 Baseline knowledge/training needs assessment 2.2.3 Define/prepare training materials 2.2.4 Give trainings 2.2.5 Monitor	\$100,000	\$25,000	\$50,000	\$25,000	

	2.3. Institutional systems strengthened to monitor adaptation investments and replicate their benefits	2.3.1 Perform institutional review 2.3.2 Make recommendations 2.3.3 Train appropriate range of officers 2.3.4 Highlight best practices and integrate into plans 2.3.5 Write case studies	\$75,000		\$25,000	\$50,000	
		<b>COMPONENT 2 TOTAL</b>	<b>\$275,000</b>	<b>\$50,000</b>	<b>\$125,000</b>	<b>\$100,000</b>	
Resilience built through investment in small-scale protective and basic service infrastructure and natural assets	3.1. 285ha of Mangroves restored in Kep City and Angkaol Communes, Kep Province	3.1.1 Site reconfirmation and finalisation 3.1.2 Develop and finalise the Mangrove Planting and Management Plan (MPMP) 3.1.3 Approve the MPMP 3.1.4 Plant the mangroves 3.1.5 Monitor the progress of the mangrove areas and highlight any problems	\$208,704	\$35,000	\$150,000	\$20,000	\$3,704
	3.2a Water gates repaired in 3 locations in Pong Teuk and Angkaol	3.2.1 a&b Reconfirm and design in further detail, based on technical drawings provided 3.2.2 Procure the necessary construction materials	\$5,328		\$5,328		
	3.2b Canals Rehabilitated in Pong Teuk and		\$76,050		\$25,000	\$40,000	\$11,050

Angkaol Communes	3.2.3 Undertake the construction work during the dry season					
<b>Output 3.3</b> Prevention of salt water ingress through improved channels	3.3.1 Final re-confirmation on ESS, considering the need for an access road 3.3.2 Procurement of hardware 3.3.3 Site clearance and access road construction 3.3.4 Install gates and embankments	\$246,000	\$30,000	\$200,000	\$16,000	
<b>Output 3.4</b> O Thmar Reservoir rehabilitated to increase water storage capability Kep Province	3.4.1 Clear the site 3.4.2 Confirm (through survey if necessary) that the site is clear on UXO 3.4.3 Procure the necessary hardware 3.4.4 Undertake excavation work	\$660,040	\$100,000	\$300,000	\$200,000	\$60,040
<b>Output 3.4b</b> Bank strengthening work at Roness Reservoir to provide additional water		\$1,304,000	\$350,000	\$500,000	\$400,000	\$54,000

retention and safety.							
<b>Output 3.5</b> Resilient Housing designs developed and demonstrations constructed (both provinces)	3.5.1 Develop in greater detail demo house drawings 3.5.2 Select training beneficiaries considering age, gender and location 3.5.3 Run educational programmes/courses for trainees 3.5.4 Construct demo houses with trainees	\$89,000	\$25,000	\$25,000	\$25,000	\$14,000	
<b>Output 3.6</b> Raised embankment and Watergate repair in Ou Ohkna Heng Commune, P. Sihanouk Province.	3.6.1 Topographic survey 3.6.2 Geotechnical survey 3.6.3 Install new gates and fill areas	\$266,100	\$50,000	\$100,000	\$100,000	\$16,100	
<b>Output 3.7</b> Drainage and Rainwater Harvesting installed at Veal Rinh Market, P. Sihanouk Province	3.7.1 Re-consult the sellers and the owner with a view to minimising risks and disruption arising from the works 3.7.2 Procure all necessary materials 3.7.3 Undertake works	\$712,905	\$75,000	\$200,000	\$400,000	\$37,905	

	<b>Output 3.8</b> Tide gauge with early warning system broadcast capabilities installed. Tide Gauge in Ou Okhna Heng Commune, Prey Nob District.		\$52,230		\$20,000	\$32,380	
	<b>Component 3 TOTAL</b>		<b>\$3,620,507</b>	<b>\$665,000</b>	<b>\$1,525,328</b>	<b>\$1,233,380</b>	<b>\$196,799</b>
	<b>PROJECT ACTIVITIES TOTAL</b>		<b>\$4,170,507</b>	<b>\$790,00</b>	<b>\$1,775,328</b>	<b>\$1,408,380</b>	<b>\$196,799</b>
<b>Programme execution</b>	Project Team Leader (part-time)	\$228,900	\$32,700	\$65,400	\$65,400	\$65,400	
	Office staff and technical support	\$55,400	\$9,800	\$15,200	\$15,200	\$15,200	
	Office facilities	\$61,989	\$13,200	\$16,263	\$16,263	\$16,263	
	Travel related to execution	\$65,112	\$18,084	\$15,676	\$15,676	\$15,676	
	Final Evaluation	\$26,387					\$26,386
	<b>PROJECT EXECUTION TOTAL</b>	<b>\$437,788</b>	<b>\$73,784</b>	<b>\$112,539</b>	<b>\$112,539</b>	<b>\$138,926</b>	

	<b>TOTAL PROGRAMME COST</b>	<b>\$4,608,295</b>	<b>\$863,784</b>	<b>\$1,887,867</b>	<b>\$1,520,919</b>	<b>\$335,724</b>
<b>Programme cycle management</b>	PSC 7 Percent (on total operational budget including components below) approx. 7.1 percent	\$325,010	\$32,511	\$65,023	\$178,813	\$48,663
	Evaluation support cost (HQ)	\$10,000	\$1,500	\$2,800	\$3,900	\$1,800
	Project Support Costs (ROAP) - Project Management Committee Meetings - IE staff salary / supervision of reports etc. - Project supervision missions	\$56,690	\$7,195	\$11,500	\$30,000	\$8,000
	<b>PROJECT CYCLE MANAGEMENT TOTAL</b>	<b>\$391,705</b>	<b>\$41,206</b>	<b>\$79,323</b>	<b>\$212,713</b>	<b>\$58,463</b>
	<b>AMOUNT OF FINANCING REQUESTED</b>	<b>\$5,000,000</b>	<b>\$904,990</b>	<b>\$1,967,190</b>	<b>\$1,733,632</b>	<b>\$394,187</b>

## H. DISBURSEMENT SCHEDULE

	Year 1	Year 2	Year 3	Year 4	Total
	1 <sup>st</sup> disbursement – upon agreement signature	2 <sup>nd</sup> disbursement – One Year after project start <ul style="list-style-type: none"> <li>▪ Upon First Annual Report</li> <li>▪ Upon financial report indicating disbursement of at least 70% of funds</li> </ul>	3 <sup>rd</sup> disbursement - Two years after project start <ul style="list-style-type: none"> <li>▪ Upon Second Annual Report</li> <li>▪ Upon financial report indicating disbursement of at least 70% of funds</li> </ul>	4 <sup>th</sup> disbursement – Third Year after Project Start <ul style="list-style-type: none"> <li>▪ Upon Third Annual Report</li> <li>▪ Upon financial report indicating disbursement of at least 70% of funds</li> </ul>	
<b>Milestone</b>	Milestones (by end of year) <ul style="list-style-type: none"> <li>- Full list of trainees decided with background info developed (for Outputs 1&amp;2)</li> <li>- Baseline knowledge/TNA complete (for outputs 1&amp;2)</li> <li>- Training materials drafted</li> <li>- MPMP Complete</li> <li>- UXO clearance report (where necessary)</li> <li>- Detailed house designs completed</li> <li>- Further market consultations complete and works underway (output 3.7)</li> </ul>	Milestones (by end of year) <ul style="list-style-type: none"> <li>- All training materials finalised 50% of training complete (for Components 1&amp;2)</li> <li>- Mangrove planting (physical works) complete</li> <li>- Output 3.2a+b construction complete</li> <li>- Output 3.3 access road complete</li> <li>- Output 3.4 Excavation underway</li> <li>- Demo house construction underway</li> <li>- Output 3.6 Topographic survey complete</li> <li>- Output 3.6 Gates installed</li> <li>- Output 3.7 physical works underway</li> <li>- Output 3.8 Procurement and import complete</li> </ul>	Milestones (by end of year) <ul style="list-style-type: none"> <li>- All training complete (Components 1&amp;2)</li> <li>- Local level plans updated</li> <li>- Output 3.3 physical works complete</li> <li>- Output 3.4 (a&amp;b) physical works complete</li> <li>- Output 3.5 all demo houses and training complete</li> <li>- Output 3.6 All physical works complete</li> <li>- Output 3.7 All physical works complete</li> <li>- Output 3.8 Tide gauge fully operational</li> </ul>	Milestones (by end of year) <ul style="list-style-type: none"> <li>- All monitoring complete</li> <li>- Case studies complete</li> <li>- Output 3.3 – Site restored to original state <b>if</b> communities don't want to keep the access road</li> <li>- Output 3.7 Best practice case study and replication designs complete</li> </ul>	

<b>Schedule date</b>	<b>October 2019 Or Upon Signing</b>	<b>October 2020</b>	<b>October 2021</b>	<b>October 2022</b>	<b>TOTAL</b>
A. Project Funds (US\$)	\$790,000	\$1,775,328	\$1,408,380	\$196,799	\$4,170,507
B. Programme Execution	\$73,784	\$112,539	\$112,539	\$138,925	\$437,788
C. Programme Cycle Mgt	\$41,206	\$79,323	\$212,713	\$58,463	\$391,705
<b>TOTAL</b>	<b>\$904,990</b>	<b>\$1,967,190</b>	<b>\$1,733,632</b>	<b>\$394,187</b>	<b>\$5,000,000</b>



## Part IV – Endorsement by Government and Certification by the Implementing Entity

### A. Record of endorsement on behalf of the government<sup>59</sup>

Provide the name and position of the government official and indicate date of endorsement. If this is a regional project/programme, list the endorsing officials all the participating countries. The endorsement letter(s) should be attached as an annex to the project/programme proposal. Please attach the endorsement letter(s) with this template; add as many participating governments if a regional project/programme:

Dr. Tin Ponlok Secretary of State National Council for Sustainable Development Designated National Authority for the Adaptation Fund of Cambodia	Date: 17 <sup>th</sup> December 2018
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The scanned letter is provided on the next page

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- <sup>6</sup> Each Party shall designate and communicate to the secretariat the authority that will endorse on behalf of the national government the projects and programmes proposed by the implementing entities.



**KINGDOM OF CAMBODIA**  
**Nation Religion King**

**National Council for Sustainable Development**  
**General Secretariat**

No: 449 GSSD

Phnom Penh, 17<sup>th</sup> December 2018

**To: The Adaptation Fund Board Secretariat**  
c/o Global Environment Facility Secretariat  
1818H Street, NW, MSN P-4-400  
Washington DC, United State of America  
Email: secretariate@adaptation-fund.org  
Fax: +1 2025223240/5

**Endorsement for “Climate Change adaptation through protective small-scale infrastructure interventions in Cambodian coastal settlements” proposal**

**Dear Sir/Madam,**

In my capacity, as Designated Authority for the Adaptation Fund in Cambodia, I confirm that the above national project is in accordance with the Royal Government of Cambodia national priorities, especially with the specific commitments to the Cambodia Climate Change Strategic Plan (2014-2023), in implementing adaptation activities to reduce the adverse impacts and risks posed by climate change in Cambodia.

Accordingly, I am pleased to endorse the above project proposal for support from the Adaptation Fund. If approved, the project will be implemented by the United Nations Human Settlements Programme (UN-Habitat) and executed by the National Council for Sustainable Development (NCS), the Ministry of Environment and Sub-National Authority of Kep and Preah Sihanouk Provinces. Several other line ministries/departments, identified sub-national authorities and non-governmental organizations will also be involved in the implementation of this project.

The project proposal builds on the relevant provincial, municipal/district and community-level climate vulnerability and local development plans/strategies. As such the project is based on a large number of in-depth consultations with Government and beneficiary communities. In close collaboration with key national Government entities and sub-national authorities, the proposal aims to support and build resilience to climate change for housing, infrastructure, environment and livelihoods through participatory planning and implementation with respect to the needs of woman, youth, elderly and other vulnerable groups.

Further, the proposal builds on the long-standing collaboration between NCSD, the Ministry of Environment and UN-Habitat. Hence, my institution is grateful for the direct support in this regard.

I sincerely hope that this proposal will be considered favorably by the Adaptation Fund.

Yours sincerely,



Tin Ponlok  
Secretary General  
NCSD/Ministry of Environment

I certify that this proposal has been prepared in accordance with guidelines provided by the Adaptation Fund Board, and prevailing National Development and Adaptation Plans, including Cambodia's Rectangular Strategy, its National Climate Change Strategy and Sector Action Plans, and its Second National Communication under the UNFCCC, and subject to the approval by the Adaptation Fund Board, commit to implementing the project/programme in compliance with the Environmental and Social Policy of the Adaptation Fund and on the understanding that the implementing entity will be fully (legally and financially) responsible for the implementation of the project/programme.

Raf Tuts, Director, Programme Division, UN-Habitat *for Phnom Penh DIC.*

Date: 03 January 2019

Tel and email: +254-20-762-3736

Project Contact Person: Laxman Perera, Human Settlements Officer, Regional Office for Asia and the Pacific,

Tel+ 81-92-724-7121

Email: [Laxman.perera@un.org](mailto:Laxman.perera@un.org)

## Annex 1 – Community Consultations and Vulnerability Assessment

### A. Summary of Results from Community Consultation in Kep and Preah Sihanouk Provinces

#### I. Kep Province

Kep province is located on low land close to the sea. Storm surge, flood and sea water intrusion were the main concerns raised during the field mission. Rice production has been affected by floods, groundwater has been contaminated by sea water, poor houses have been destroyed by storms, and the coastline has been eroded by sea level rise and strong waves.

Kep province is highly vulnerable to climate change, especially in Angkaol commune. Storms are predominant concerns, while floods, saline intrusion (as influenced by sea level rise) and coastline erosion are as additional concerns. The highest vulnerabilities relates to agriculture (rice fields and salt farms). The vulnerability affects social welfare (and public health, economic growth and livelihoods), and unique habitats and ecosystems. Cultivated land is known to be vulnerable to saline intrusion in low land areas. The production of rice and crops are reduced due to poor soil quality and salinity. Storm surge causes disturbance to daily living and destruct agriculture production.

There are five target communes/ sangkat in Kep province as below information:

#### 1. Beneficiaries

No.	Name of Sangkat/commune	Angkaol	Pong Tuek	Prey Thom	Kep
1	Number of villages/Communities	4	7	3	2
2	Total population	8,566	10,987	8,521	4,917
3	Number of Female	4,280	5,574	3,994	2,358
4	# of age 0-17	3,288	4,579	2,969	2,111
5	# of age 18-60	4,729	5,668	5,112	2,262
6	# of > age 60	549	740	440	544
7	# of indigenous people	0	0	0	0
8	# of disabled population	108	169	78	98
9	# of informal settlements	20	25	260	13
10	# of households	1,835	2,481	1,917	1,074
11	Poverty rate (%)	18,04	11,66	11,41	9,30
12	How many people (percent) will benefit from the following interventions in the community: Main climate change impacts and risks need are: Storm, flood, Saline intrusion, drought				

	Physical/structural interventions (roads, bridges, agriculture irrigation, water supply facilities, drainage system, houses)	80%	80%	50%	50%
	Trainings	50%	50%	50%	30%
	Communication	100%	100%	100%	100%
	Information	100%	100%	100%	100%
14	Early warning systems in place covering different types of hazards (e.g. floods, cyclones, storms, droughts, etc.)				
15	Existence of drainage and sewage system	No system in place			
16	Existence of different groups (ethnic, women, elderly, disabled, youth) who are treated differently. If so, how?				
17	Participation of women in decision-making process. If no, why?				
18	Responsible person to take elderly, disabled people and children				
19	Main livelihoods / sources of income in community?				

## 2. Climate change – impacts, barriers for adaptation and possible interventions analysis

No	Name of Sangkat/commune	Most problematic climatic hazard	Effects	Factors stopping your community from coping with	Prioritized activities/ infrastructure to enhance adaptive capacity

				<b>current impacts</b>	
1	Angkaol	<ul style="list-style-type: none"> <li>• Storm surge</li> <li>• Flood and sea water intrusion</li> <li>• Sea level rise and strong waves</li> <li>• Drought</li> <li>• Beach erosion</li> <li>• Water pollution</li> </ul>	<ul style="list-style-type: none"> <li>• Low rice production</li> <li>• Contaminated ground water</li> <li>• Destroyed houses</li> <li>• Slow down fishing activities</li> <li>• Damaged roads and dikes</li> <li>• Coastline erosion</li> <li>• Lack of water supply</li> <li>• Poor sanitation and health issues</li> </ul>	<ul style="list-style-type: none"> <li>• Bad infrastructure</li> <li>• Limited irrigation</li> <li>• Insufficient clean water supply</li> <li>• Limited of education and skills</li> <li>• Lack of sanitation</li> <li>• Health issues</li> <li>• Poor management of natural resources like forests</li> <li>• Poor houses</li> </ul>	<ul style="list-style-type: none"> <li>• Improve road condition and drainage system</li> <li>• Agriculture irrigation</li> <li>• Trees plantation on coastline</li> <li>• Water supply by digging new ponds and wells</li> <li>• Conserve and protect natural resources and biodiversity</li> <li>• Resilient houses models</li> <li>• Environmental management activities, e.g. planting trees, improve sanitation</li> <li>• Provide vocational training on various topics</li> </ul>
2	Pong Tuek				
3	Prey Thom				
5	Kep				

Note: Climate hazards, effects, coping barriers and priority interventions have been consolidated because they are similar in each Sangkat/commune.

### 3. Strengthened institutional capacity

No.	Name of Sangkat/commune	Angkaol	Pong Tuek	Prey Thom	Kep
1	Having a structured plan for hazard risk reduction/ climate change adaptation	Yes, the structured plan in place but there is no facilities and financial assistance as well as limited capacity on			

		climate change adaptation and resilience.
2	Experience of the municipality on specialist training (for risk reduction and resilience)	There is no/limited capacity/experience at municipality or provincial level on specialist training. Usually, national specialists provide these such trainings.
3	Having a CC and resilience plan incorporated into planning schemes	Yes, commune development plan has been elaborated climate change but limited implementation due to no fund and capacity.
4	Reporting awareness of exposure to at least one key hazard	No, local community could not make a report on this matter due to lack of capacity. National and provincial officials have assisted on this report.

#### 4. Assets produced, developed or strengthened (Health issues related to climate change)

No.	Name of Sangkat/commune	Angkaol	Pong Tuek	Prey Thom	Kep
1	# of households to report an occupant with diarrhoea in last 3 months in this settlement	0	0	0	0
2	# of households to report an occupant with malaria/ dengue last year	0	0	0	0
3	Existence of drainage issues that may give rise to mosquito borne diseases	Yes	Yes	Yes	Yes
4	Main health problems/ issues	No major health issues but lack of sanitation and hygiene cause of health problem to children and women. Blood pressure and liver function are main health issue for older people.			

#### 5. Urban development and housing

No.	Name of Sangkat/commune	Angkaol	Pong Tuek	Prey Thom	Kep
1	# of dwellings with 'average' or 'poor' quality walls	1,363	1,423	1,282	660
2	# of overcrowded dwellings	43	17	28	8
3	# of dwellings, which have been trained on enhancing dwelling resilience	0	0	0	0



## 6. Physical Infrastructure

No.	Name of Sangkat/commune	Angkaol	Pong Tuek	Prey Thom	Kep
1	Are the streets and roads in this settlement planned and paved?	y	y	y	y
2	How many schools are there in this settlement? Are they built in a resilient manner?	7	7	5	2
3	How many hospitals/health posts are there in this settlement? Are they built in a resilient manner?	1	2	1	0
4	Are the necessary protective infrastructures in place (e.g. dams and walls) to reduce impact of flooding, storms, etc. in this community?	0; small canal to receive water from Pong Tuek 2 dams to avoid salt water intrusion into rain fields	1	Shared with Ou Krasar, only 20% has been used by Prey Thom; 1 reservoir.	0
5	Does this settlement have an operational drainage system? Is it sufficient to drain precipitation and avoid flooding?	n	n	n	n
6	How many pagodas/mosques	3	5	3	3

## 7. Water resources and infrastructure

No.	Name of Sangkat/commune	Angkaol	Pong Tuek	Prey Thom	Kep
1	# of households with toilet	1,618	1,627	1,125	605

<b>2</b>	% of households using following types of toilets: 1) Shared community toilet 2) Share neighbours 3) Connected to septic tank 4) Straight pipe 5) Connected to town sewerage system	90% - Straight pipe 10% - Septic tanks	90% - Straight pipe 10% - Septic tanks	80% - Straight pipe 20% - Septic tanks	70% - Straight pipe 30% - Septic tanks
<b>3</b>	Average type of toilet: 1) Water seal 2) Flush 3) Pit	90% - Pit 10% - Flush	90% - Pit 10% - Flush	60% - Pit 40% - Flush	60% - Pit 40% - Flush
<b>4</b>	% of households with toilet discharging directly into the environment (unimproved pit toilet or straight pipe to sea/river/etc,)	100%	100%	100%	100%
<b>5</b>	Main water resource for livelihood	Surface water (ponds), ground water (wells), and rain water			
<b>6</b>	# of households that own (not shared) formal water connection with meter	162	1,658	459	439

### 8. Waste and waste infrastructure

No.	Name of Sangkat/commune	Angkaol	Pong Tuek	Prey Thom	Kep
<b>1</b>	Existence of regular waste collection by council or private organization	No	No	No	Yes
<b>2</b>	% of households to dispose waste in river, creek, or sea	10%	15%	15%	5%
<b>3</b>	% of households to burn or bury waste	90%	85%	85%	20%

### 9. Natural assets protected or rehabilitated

No.	Name of Sangkat/commune	Angkaol	Pong Tuek	Prey Thom	Kep
<b>1</b>	Does this settlement report issues with pollution/ environmental degradation (e.g. coral or mangroves)? And how many people affected - livelihoods	Yes, local settlement report issues with pollution and environment degradation that affected to majority of people in the city, particularly fisherman.			
<b>2</b>	Has any steps been taken in this settlement to improve/	Due to no financial assistance, there is no major action taken place. Individual			

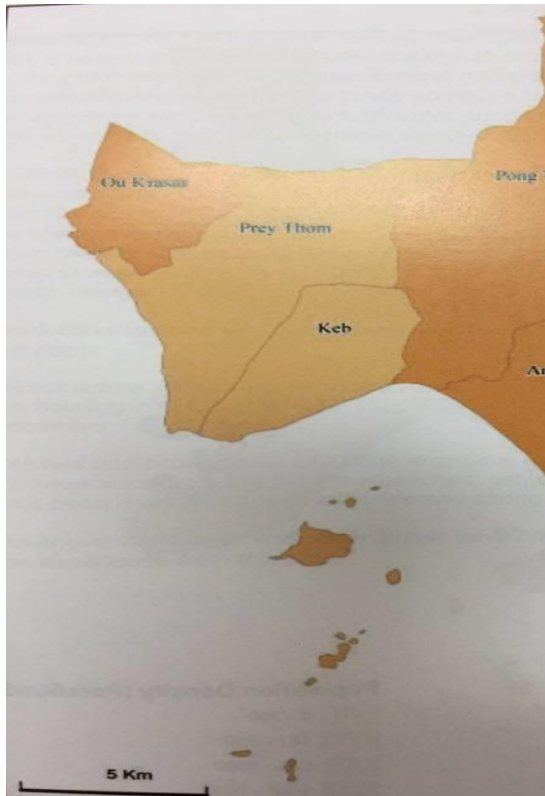
	maintain/reduce impacts on natural assets? And how many people affected - livelihoods	people have taken care for themselves. There is around 20-30% of population affected their livelihood.	
	<p>Main environmental problems <b>(Choose Top 3)</b></p> <ol style="list-style-type: none"> <li>1) River flooding</li> <li>2) Coastal Flooding (saltwater intrusion)</li> <li>3) Surface Flooding (rainwater)</li> <li>4) River Bank Erosion (soil disappearing)</li> <li>5) Inland erosion</li> <li>6) Coastal Erosion (beach disappearing)</li> <li>7) Pollution (dirty air, dirty water, dirty soil)</li> <li>8) Rubbish (waste management)</li> <li>9) Drainage (e.g., blocked drains)</li> <li>10) Sanitation (problems with toilet)</li> <li>11) Decline in Mangrove areas</li> <li>12) Plant Disease</li> <li>13) Insects or bugs (flies, mosquitoes)</li> </ol>	<ol style="list-style-type: none"> <li>1. Coastal Flooding (saltwater intrusion)</li> <li>2. Decline in Mangrove areas</li> <li>3. Surface Flooding (rainwater)</li> <li>4. Freshwater for drinking and usage</li> </ol>	<ol style="list-style-type: none"> <li>1. Drainage (e.g. blocked drains)</li> <li>2. Sanitation (problems with toilet)</li> <li>3. Decline in Mangrove areas</li> <li>4. Surface flood</li> </ol>

#### 10. Improved policies & regulations

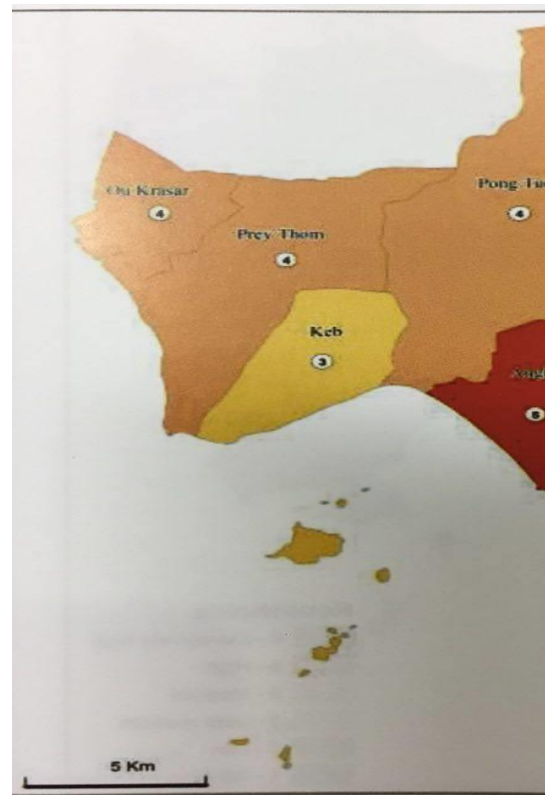
No.	Name of Sangkat/commune	Angkaol	Pong Tuek	Prey Thom	Kep
1	Does the sangkat/commune has the necessary building regulations for resilient development? Are they enforced properly in this community?	There are building regulations from national that has applied for nationwide usage. They are enforced by technical line department of land management, urban planning and construction. However, there is very limited information on the resilient development in those regulations.			
2	Have any policies been introduced or adjusted in your municipality to address climate change?	There is no local policy to address climate change but they implement the national climate change action plan and NAPA. Commune development plan and investment programme have also addressed climate change and disaster risk reduction.			

## 11. Community vulnerability and risk map

Poverty Map of Kep Province by Commune



Overall Vulnerability of Kep Province by Commune



## II. Preah Sihanouk Province

Several climate change issues were discussed during the field consultation. Concerns included erratic rainfall, sea water intrusion on rice fields and ground water, storms and storm surge destroying rice and crop production, and waste management.

Households: Poor households living in homes built with zinc and thatched roofs, located on low lands along the coastline, are sensitive to storm surge and sea level rise. These CC exposures also affect drinking water, sanitation, health and livelihoods. Drought or erratic rainfall is also main issues that can affect water supplies and drinking water when the dry season lasts longer than usual. The capacity of these people to recover from extreme weather is still limited. Additionally, the management of solid water is also an issue, as it was found that the waste was floated during the floods.

The assessment studied 10 communes in Preah Sihanouk Province. Note, only 7 of these are included in the final project proposal.

### 1. Beneficiaries

N o.	Municipality / District	Prey Nob	Sihanouk ville
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	<b>Name of Sangkat/commune</b>	Tu ek Thl a	Tu ek L'a k	Sam akki	Vea l Rin h	Sam rong	Pre y No b	Ou Okn ha Hen g	Boe ng Tapr om	Ko h Ro ng	San gkat Muoy
1	Number of Villages/communities	4	4	3	3	5	5	5	6	2	3
2	Total population	5,455	4,413	3,641	10,717	6,683	7,944	9,006	7,917	1,693	18,613
3	Number of Female	2,720	2,198	1,919	5,636	3,334	3,976	4,559	4,025	791	9,308
4	# of age 0 - 17	2,133	1,728	1,620	3,850	2,474	2,909	3,696	2,170	611	7,316
5	# of age 18 - 60	2,930	2,182	1,724	6,007	3,795	4,163	4,834	4,847	985	10,324
6	# of > age 60	392	503	297	860	414	872	476	900	97	973
7	# of indigenous people	0	0	0	0	127	0	0	0	0	0
8	# of disabled population	25	25	19	80	37	42	115	83	7	46
9	# of immigrants	551	178	101	628	223	340	139	464	526	5,582
10	# of informal settlements	45	13	0	40	17	42	21	5	330	160
11	# of households	1,169	963	1,044	1,967	1,352	1,608	1,688	1,503	427	4,094
12	Poverty rate (%)	20.2	20.1	19.2	26.3	19.8	18.8	18.0	12.6	23.7	11.7
13	How many people will benefit from the following interventions in the community: The main climate change impacts and risks need to be focused are: storm surge, strong waves, sea water intrusion, ground water, pollution, drinking water, waste and flood.										
	Physical/structural interventions (roads, dikes, water supply facilities, market, irrigation, drainage system, houses)	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%

	Trainings	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
	Communication	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
	Information	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
14	Early warning systems in place covering different types of hazards (e.g. floods, storms, drought etc.)	There is no local early warning system in place but they receive warning system from Ministry of Water Resources and Meteorology through TV, media and local authorities.									
15	Existence of drainage/sewage system	There is limited drainage system available only in the downtown									
16	Existence of different groups (ethnic, women, elderly, disabled, youth) who are treated differently. If so, how?	There are no different groups established. They are under the supervision and management of Commune's children and women committee									
17	Participation of women in decision-making process. If no, why?	Yes, women have involved all level of decision-making but they have limited knowledge and experience.									
18	Responsible person to take elderly, disabled people and children	There are provincial, district and commune disaster committees and red-cross committee's responsibilities.									
19	Main livelihoods / sources of income in community?	Fishery, agriculture, industry, poultry/animal raising, building construction and tourism									

## 2. Climate change - Trend analysis

No	Municipality/ District	Name of Sangkat/commune	Most problematic climatic hazard	Effects	Factors stopping your community from coping with current impacts	Prioritized activities/ infrastructure to enhance adaptive capacity
1	Prey Nob	Tuek Thla	<ul style="list-style-type: none"> <li>Storm surge</li> <li>Strong waves</li> <li>Sea water intrusion</li> <li>Ground water</li> <li>Pollution</li> <li>Drinking water</li> <li>Waste management</li> <li>Flood, and</li> <li>Sea level rise,</li> </ul>	<ul style="list-style-type: none"> <li>No tourists to visit</li> <li>Destroyed houses</li> <li>Damaged roads and dikes</li> <li>Low fish production</li> <li>Low rice production</li> <li>Contaminated ground water</li> <li>Coastline erosion</li> <li>Lack of water supply</li> <li>Poor sanitation and health issues</li> </ul>	<ul style="list-style-type: none"> <li>Low income that affect to livelihood due to no tourists</li> <li>Bad infrastructure</li> <li>Insufficient clean water supply</li> <li>Poor house conditions</li> <li>Lack of sanitation</li> <li>Health issues</li> <li>Poor management of natural resources like forests</li> <li>Limited irrigation</li> <li>Limited of education and skills</li> </ul>	<ul style="list-style-type: none"> <li>Improve road condition</li> <li>Provide clean water supply</li> <li>Provide proper drainage system</li> <li>Conserve and protect natural resources and biodiversity</li> <li>Provide resilient house models</li> <li>Environmental management activities, e.g. planting trees, improve sanitation</li> <li>Provide vocational training on various topics</li> <li>Agriculture irrigation</li> </ul>
2		Tuek L'ak				
3		Sameakkhi				
4		Veal Renh				
5		Samrong				
6		Prey Nob				
7		Ou Oknha Heng				
8		Boeng Taprom				
9	Sihanoukville	Koh Rong				
10		Sangkat Muoy				

### 3. Strengthened institutional capacity

No	Municipality/ District	Prey Nob									Sihanoukville	
	Name of Sangkat/commune	Tuek Thla	Tuek L'ak	Samekki	Veal Rin h	Samrong	Prey Nob	Ou Oknha Heng	Boeng Taprom	Koh Rong	Sangkat Muoy	

1	Having a structured plan for hazard risk reduction/ climate change adaptation	Yes, there is a structured plan in place but very limited operation/function due to no capacity and fund.
2	Experience of the municipality on specialist training (for risk reduction and resilience)	No specialist training from the municipality/district level to support the communities. They are from provincial and national level with limited supported.
3	Having a CC and resilience plan incorporated into planning schemes	Yes, all plans such as commune, district/municipality, and provincial development plans have addressed climate change adaptation and resilience. However, the implementation is limited due to low capacity and financial support.
4	Reporting awareness of exposure to at least one key hazard	Yes, there is a report on disaster happened in the areas such as storms and flood.

#### 4. Assets produced, developed or strengthened (Health issues related to climate change)

No.	Municipality/ District	Prey Nob								Sihanouk ville	
	Name of Sangkat/commune	Tuek Thla	Tuek L'ak	Samakki	Veal Rinh	Samrong	Prey Nob	Ouk Heng	Boeung Taprom	Koh Rong	Sangkat Muoy
1	# of households to report an occupant with diarrhoea in last 3 months in this settlement	0	0	0	0	0	0	0	0	0	0
2	# of households to report an occupant with malaria/ dengue last year	0	0	0	0	0	0	0	0	0	0
3	Existence of drainage issues that may give rise to mosquito borne diseases	Yes, there is drainage issues such as bad smell, pollution, mosquito and bad living environment									
4	Main health problems/ issues	There are skin diseases, mosquito borne diseases and high blood pressure									

#### 5. Urban development and housing

No.	Municipality / District	Prey Nob	Sihanouk ville
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	<b>Name of Sangkat/commune</b>	Tu ek Thl a	Tu ek L'a k	Sam akki	Ve al Rin h	Sam rong	Pre y No b	Ou Okn ha Hen g	Boe ng Tapr om	Ko h Ron g	Sang kat Muoy
<b>1</b>	# of dwellings with 'average' or 'poor' quality walls	97 3	87 9	854	1,3 99	1,187	1,3 92	1,43 8	1,34 2	37 3	3,15 7
<b>2</b>	# of overcrowded dwellings	30	23	47	50	11	7	30	10	29	46
<b>3</b>	# of dwellings, which have been trained on enhancing dwelling resilience	0	0	0	0	0	0	0	0	0	0

## 6. Physical Infrastructure

<b>No.</b>	<b>Municipality/ District</b>	<b>Prey Nob</b>								<b>Sihanoukville</b>	
	<b>Name of Sangkat/commune</b>	Tue k Thla	Tu ek L'a k	Sam akki	Ve al Rin h	Sam rong	Prey Nob	Ou Okn ha Hen g	Boe ng Tapr om	Koh Ron g	San gkat Muoy
<b>1</b>	Are the streets and roads in this settlement planned and paved?	y	y	y	y	y	y	y	y	n	20%
<b>2</b>	How many schools are there in this settlement? Are they built in a resilient manner?	4	3	3	2	3	3	3	5	2	3

<b>3</b>	How many hospitals/health posts are there in this settlement? Are they built in a resilient manner?	0	3	1	1	0	1	0	1	1	1
<b>4</b>	Are the necessary protective infrastructures in place (e.g. dams, walls) to reduce impact of flooding, storms, etc. in this community?	0	1	0	1	2	3	0	1	0	0
<b>5</b>	Does this settlement have an operational drainage system? Is it sufficient to drain precipitation and avoid flooding?	n	n	n	n	n	n	n	n	n	n
<b>6</b>	How many Pagodas/Mosques exist?	2 Mosques	1 Pagoda	2 Pagodas	2 Pagodas	5 Pagodas	2 Pagodas and 2 Mosques	2 Pagodas and 3 Mosques	2 Pagodas and 3 Mosques; 50 % of the people are	1 Pagoda	1 Pagodas

										Cham Muslims		
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### 7. Water resources and infrastructure

No	Municipality/ District	Prey Nob								Sihanoukville	
	Name of Sangkat/com mune	Tuek Thla	Tuek L'ak	Samakki	Veal Rin h	Sa mro ng	Pre y Nob	Ou Okn ha Hen g	Boe ng Taprom	Ko h Ro ng	San gkat Muo y
1	# of households with toilet	455	702	724	1,433	794	1,254	777	760	318	3,757
2	% of households using following types of toilets: 1) Shared community toilet 2) Share neighbours 3) Connected to septic tank 4) Straight pipe 5) Connected to sewerage system	Straight pipe – 100%	Straight pipe – 100%	Straight pipe – 100%	Straight pipe – 100%	Straight pipe – 100%	Straight pipe – 100%	Straight pipe – 100%	Straight pipe – 100%	Straight pipe – 100%	Straight pipe – 70% Septic tank – 30%
3	Average type of toilet: 1) Water seal 2) Flush 3) Pit	Flush	Flush	Flush	Flush	Flush	Flush	Flush	Flush	Flush	Flush
3	% of households with toilet discharging directly into	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

	the environment (unimproved pit toilet or straight pipe to sea/river/etc.)										
<b>3</b>	Main water resource for livelihood	Surface water, underground water, ponds, wells, and rainwater									
<b>4</b>	# of households that own (not shared) formal water connection with meter	872	598	905	1,955	877	965	698	1,225	95	3,043

#### 8. Waste and waste infrastructure

N o.	Municipality / District	Prey Nob									Sihanouk ville
	Name of Sangkat/commune	Tu ek Thl a	Tu ek L'a k	Sam akki	Ve al Ri nh	Sam r ong	Pr ey No b	Ou Okn ha Hen g	Boen g Tapr om	Ko h Ro ng	Sang kat Muoy
<b>1</b>	Existence of regular waste collection by council or private organization	No	No	No	No	No	No	No	No	No	No
<b>2</b>	% of households to dispose waste in river, creek, or sea	20%	20%	20%	10%	20%	20%	20%	20%	10%	15%
<b>3</b>	% of households to burn or bury waste	80%	80%	80%	90%	80%	80%	80%		90%	85%

#### 9. Natural assets protected or rehabilitated

N o.	Municipality/ District	Prey Nob	Sihanoukville
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	<b>Name of Sangkat/commune</b>	Tu ek Thl a	Tu ek L'a k	Sama kki	Ve al Ri nh	Samr ong	Pr ey No b	Ou Okn ha Hen g	Boen g Tapr om	Ko h Ro ng	Sang kat Muoy	
<b>1</b>	Does this settlement report issues with pollution/ environmental degradation (e.g. coral or mangroves) ?	Yes, local settlement report issues with pollution and environment degradation that affected to majority of people in the communities.										
<b>2</b>	Has any steps been taken in this settlement to improve/maintain/reduce impacts on natural assets?	There is very limited implementation because no fund support. Community people have taken care for themselves. There is around 50% of population affected their livelihood.										
	Main environmental problems <b>(Choose Top 3)</b> 1) River flooding 2) Coastal Flooding (saltwater intrusion) 3) Surface Flooding (rainwater) 4) River Bank Erosion	<ul style="list-style-type: none"> <li>• Decline in Mangrove areas</li> <li>• Drainage (e.g., blocked drains)</li> <li>• River flooding, coastal flooding (saltwater intrusion), surface flooding (rainwater)</li> </ul>							<ul style="list-style-type: none"> <li>• Deforestation</li> <li>• Pollution / Rubbish/ Drainage / Sanitation</li> <li>• Coastal Erosion</li> </ul>			

	(soil disappearing) 5) Inland erosion 6) Coastal Erosion (beach disappearing) 7) Pollution (dirty air, dirty water, dirty soil) 8) Rubbish (waste management) 9) Drainage (e.g. blocked drains) 10) Sanitation (problems with toilet) 11) Decline in Mangrove areas 12) Plant Disease 13) Insects or bugs (flies, mosquitoes)		
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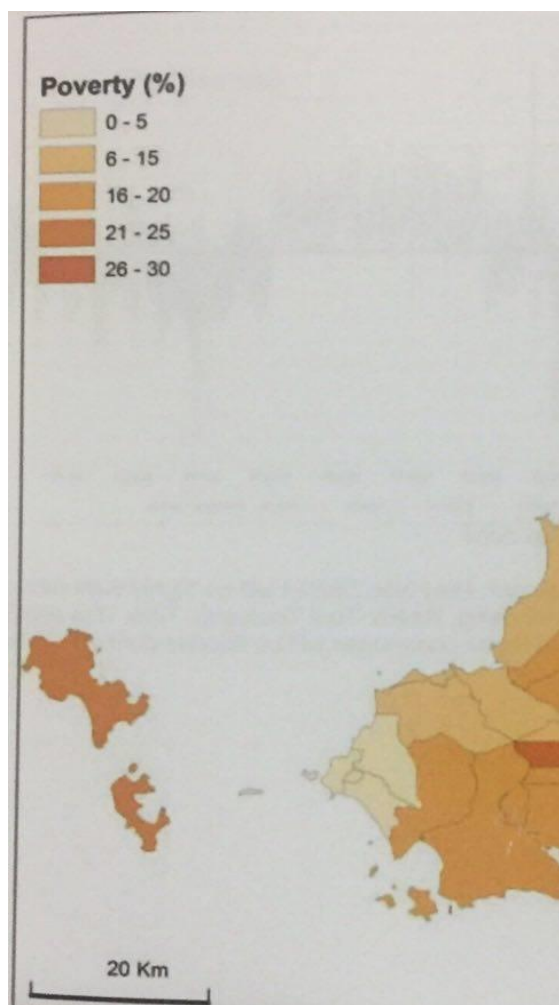
**10. Improved policies & regulations**

<b>No.</b>	<b>Municipality / District</b>	<b>Prey Nob</b>	<b>Sihanouk ville</b>
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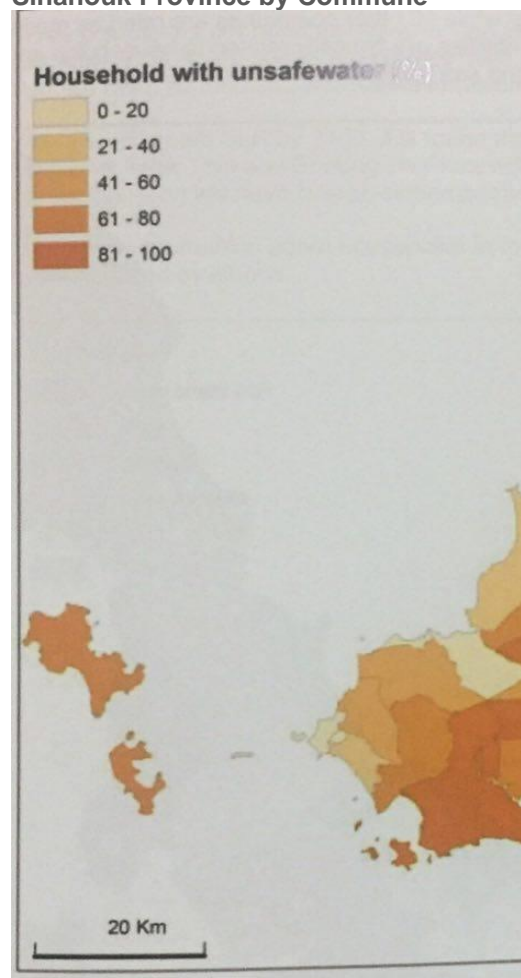
	<b>Name of Sangkat/commune</b>	Tu ek Thl a	Tu ek L'a k	Sam akki	Ve al Ri nh	Sam rong	Pr ey No b	Ou Okn ha Hen g	Boen g Tapr om	Ko h Ro ng	Sang kat Muoy
<b>1</b>	Does the sangkat/commune has the necessary building regulations for resilient development? Are they enforced properly in this community?	No, they don't have a local building regulation. So people in the community to build their houses based on their experience and practice. However, the Ministry of Land Management, Urban Planning and Construction has issued all necessary building regulations that applied for nationwide implementation. But those regulations may not include the resilient development.									
<b>2</b>	Have any policies been introduced or adjusted in your municipality to address climate change?	There is no local policy to address climate change, but they implement the national climate change action plan and NAPA. Commune development plan and investment programme have also addressed climate change and disaster risk reduction.									

## 11. Community vulnerability and risk map

Poverty Map of Preah Sihanouk Province by Commune



Household with unsafe water of Preah Sihanouk Province by Commune



## B. Action Planning

Prognoses of interventions based on in-depth community consultation in target provinces. Information in below tables established the basis to identify the catalogue of intended sub-projects.

### I. In Kep Province

Commune/ Sangkat of Kep Province	Main Climate Change Impact	Activities		
Angkaol	1. Strong winds (more than 100 HH in 2013 and	1.1. Advocacy on planting more trees	1.2. Demonstration	



	20-30 per year)		of resilient housing design	
	2. Sea water floods	2.1. Protective infrastructure (road or dam)		
	3. SLR and beach erosion	3.1. Erosion vulnerability assessment and hazard map	3.2. Protective infrastructure (road)	
Pong Tuek	1. Strong winds (20-30 HH per year)	1.1. Advocacy on planting more trees	1.2. Demonstration of resilient housing design	
	2. SLR and salinization	2.1. Advocacy on reforestation of the coast-line	2.2. Protective infrastructure (canal, fresh water reservoir)	2.3. Salt-resilient crops for agriculture
	3. Beach erosion	3.1. Erosion vulnerability assessment and hazard map	3.2. Protective infrastructure (road)	
Prey Thom	1. Drought	1.1. Fresh water reservoir		
	2. Lack of water supply	2.1. Rain water harvesting	2.2. Piped water supply	2.3. Advocacy esp. to children and women about health issues of unsafe water
	3. Strong wind (60 HH destroyed per year)	3.1. Advocacy on planting more trees	3.2. Demonstration of resilient housing design	
Kep	1. Flood	1.1. Improvement of flood-protective 3-4 km long canal (shared with Ou Krasar commune)		
	2. Drought	2.1. Water supply from Kampot is a		

		goal of the CIP for 2022, but water shortage is an urgent issue of today		
	3. Strong wind (20 HH destroyed per year)	3.1. Advocacy on planting more trees	3.2. Demonstration of resilient housing design	
Ou Krasar	1. Strong wind	1.1. Advocacy on planting more trees	1.2. Demonstration of resilient housing design	
	2. Unsafe water	2.1. Awareness on health issues to unsafe water and how to avoid		
	3. Drought	3.1. Rehabilitation of irrigation and capacity to harvest water during dry season	3.2. Drought-resilient crop for agriculture	

## II. In Preah Sihanouk Province<sup>60</sup>

Commune/Sangkat of Preah Sihanouk Province	Main Climate Change issue	Activities		
Tuek Thla	1. Drought	1.1. Rehabilitate reservoir located in one village to improve the water supply for the whole year		
	2. Flood	2.1. Build water gate		

<sup>60</sup> Because the project will not implement the concrete component in Koh Rong and logistical constraints, the mission from 11th to 16th of December 2017, where actions were identified, did not visit the Koh Rong commune, an island about 27 km from the mainland

		for existing reservoir		
	3. Strong wind	3.1. Advocacy on planting more trees	3.2. Weather station, broadcasting extreme weather events and EWS	3.3. Demonstration of resilient housing design and training of local craftsmen
Tuek L'ak <sup>61</sup>	1. Drought	1.1. Build a reservoir or dam with water gate to keep water		
	2. Flood	2.1. Assess possible infrastructure like canals to channel rain water		
	3. Strong wind	3.1. Advocacy on planting more trees	3.2. Weather station, broadcasting extreme weather events and EWS	3.3. Demonstration of resilient housing design and training of local craftsmen
	4. Decline of mangroves	4.1. Make eco-tourism areas accessible	4.2. Demarcation of areas for eco-tourism	
Samakki	1. Flood	1.1. Repair the water gate		
	2. Strong wind (100 HH per year destroyed in	2.1. Advocacy on planting more trees	2.2. Weather station, broadcasting extreme	2.3. Demonstration of resilient housing

<sup>61</sup> Natural protected area of Kampong Smach involving 6 communes of Prey Nob District (Tuek Lak, Samakki, Veal Renh, Ou Oknha Heng, Samrong and Boeng Taprom).

	Tuek Thla, Tuek L'ak and Samakki)		weather events and EWS	design and training of local craftsmen
	3. Drought (Jan-May no drinking water. It needs to be bought costly from neighbouring communes)	3.1. Build dam and water gate that keeps water for 100 ha of land during the dry season		
	4. Decline of mangroves	4.1. Make eco-tourism areas accessible	4.2. Demarcation of areas for eco-tourism	
Veal Rinh	1. Strong wind	1.1. Advocacy on planting more trees	1.2. Weather station, broadcasting extreme weather events and EWS	1.3. Demonstration of resilient housing design and training of local craftsmen
	2. Drought (Jan-May no drinking water. It needs to be bought costly from neighbouring communes)	2.1. Improve access to drinking water by building dam or channel water through canals		
	3. Flood	3.1. Channel floods through canals and water gates		
	4. Decline of mangroves	4.1. Make eco-tourism	4.2. Demarcation	

		areas accessible	of areas for eco-tourism	
Samrong	1. Drought	1.1. Build water gate to channel and harvest rain water		
	2. Flood	2.1. Repair roads that were damaged by floods	2.2. Build water gate to channel rain water during heavy rainfalls	
	3. Strong winds	3.1. Advocacy on planting more trees	3.2. Weather station, broadcasting extreme weather events and EWS	3.3. Demonstration of resilient housing design and training of local craftsmen
	4. Decline of mangroves	4.1. Make eco-tourism areas accessible	4.2. Demarcation of areas for eco-tourism	
Prey Nob	1. Drought	1.1. Rehabilitation of canals in Oknha Heng could keep the water channelled in Prey Nob		
	2. Flood (affects esp. the market, the source of regular income of the people)	2.1. Rehabilitation of canals in Oknha Heng can avoid floods in Prey Nob	2.2. Build drainage system and sanitation system esp. around the market	
	3. SLR	3.1. Improve 8km of road to protect the road to the		

		garment factory from SLR		
Ou Oknha Heng	1. Salinization	1.1. Rehabilitation of protected dam along 3 villages in order to avoid sea-water intrusion of the rice fields	1.2. Improvement of canals across the communes	
	2. Drought	2.1. Rehabilitation of canal to provide fresh water during dry season	2.2. Build barriers for animals to avoid contamination of fresh water reservoirs	
	3. Decline of mangroves	3.1. Make eco-tourism areas accessible	3.2. Demarcation of areas for eco-tourism	
Boeng Taprom	1. Flood	1.1 Rehabilitate the canal to channel floods and harvest fresh-water in the dry season		
	2. Salinization	2.1. Rehabilitate the canal to protect fresh-water from sea-water intrusion	2.2. Build dam (or protective infrastructure) to mitigate SLR	
	3. Decline of mangroves	3.1. Make eco-tourism	3.2. Demarcation	

		areas accessible	of areas for eco-tourism	
Sangkat Muoy	1. Drought	1.1. Build water pipelines. Esp. people living on the hill-side cannot access water during the dry season. Approx. 500 HH have no access to safe drinking water.	1.2. Wastewater sewage system can also avoid contamination of rain water, which otherwise goes straight into the sea. But difficult to implement due to land ownership issues.	
	2. Strong wind	2.1. Advocacy on planting more trees	2.2. Demonstration of resilient housing design and training of local craftsmen	
	3. Lack of drainage system and wastewater management system	3.1. Build wastewater treatment plant	3.2. Channel drainage to redirect the water flow	

## Annex 2: Project Investments under Component 3

### 3.1. MANGROVE PLANTATIONS FOR IMPROVED COASTAL RESILIENCE

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#### INTRODUCTION

##### *Problem statement*

Mangrove ecosystems are rapidly declining in many parts of the world. This has resulted in the loss of important environmental and economic products and services including agricultural products, flood mitigation and nursery grounds for fish.





<b>Deliverables</b>	Delivery of mangrove plantation for coastal resiliency
<b>Beneficiaries</b>	17,754
<b>Budget</b>	\$208,704 (USD)
<b>Location</b>	All Communes

Consultations with local communes in Kep Province and Prey Nob District have identified that coastal communities are being impacted by climate change and its effects on the coastal environment, leading to the serious consequences for local people. The identified environmental impacts listed below can be attributed to a combination of declining mangrove ecosystems and/or insufficient coverage by existing mangrove reserves and the impacts of climate change:

- Significant reduction in fish levels for local fishermen and women;
- Coastal erosion leading to loss in coastal agricultural land and damage to coastal infrastructure;
- Storm surges resulting in salt water ingress into the local agricultural land and surface water, resulting in decreasing agricultural productivity and surface water availability;
- Reduced resilience of houses in the coastal area to flooding and high winds, contributing to potential loss of life and property damage.

This investment will plant mangroves along the coast in Prey Thom, Kep Pong Teuk and Angkaol Communes in Kep Province and Prey Nob Commune in Prey Nob District establish mangrove protected areas in these locations.

The case of environmental and socio-economic benefits for this investment are strong: as per the International Federation of Red Cross and Red Crescent Societies (IFRC) study dated 2011 *Mangrove plantation in Viet Nam: measuring impact and cost benefit* the plantation of mangroves over a 30-year period is estimated to provide benefits per hectare of mangrove plantation 28 to 104 times the initial establishment costs.

## *Location*

The selected locations for mangrove plantation in this investment are all in area classified as 'state public land', and thus do not impact private land, but provide protection to land behind the plantations as well as preventing coastal erosion, and supporting marine biodiversity through increased fish and crab spawning areas.

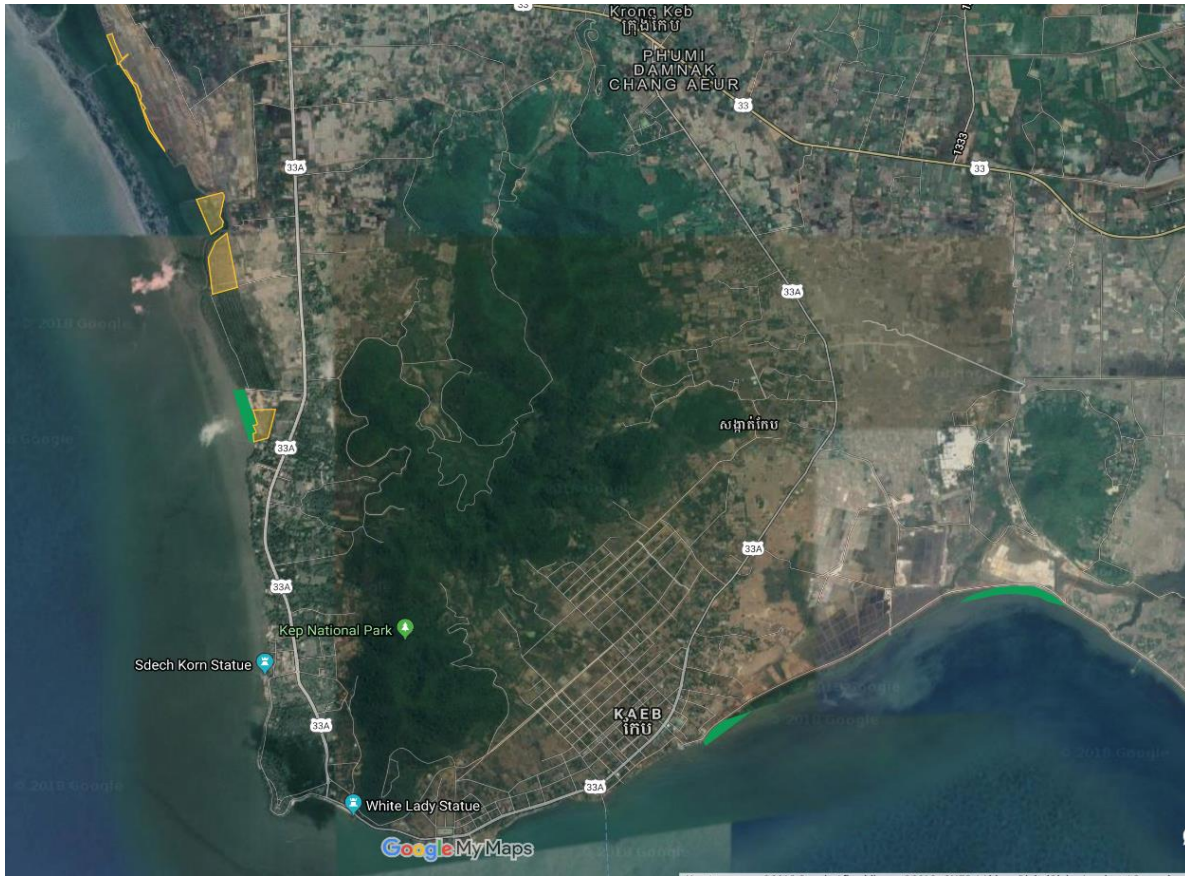
Land maps below are coloured based on the anticipated chance of that proposed plantation will achieve all criteria within the Mangrove Planting Management Plan and be targeted for plantation:

Green – target areas for the project where there will strengthen the existing mangrove plantation

Yellow – Proposed new mangrove plantations, supported by the project

Red – alternative locations for mangrove plantation if the situation of land ownership or suitability for plantation of the yellow areas changes between now and the start of the project implementation.

- Green: Areas indicated in green are areas where mangrove plantation is expected to be achieved with a very high probability of success;
- Yellow: Areas indicated in yellow are areas where mangrove plantation s expected to be achieved with a high probability of success;



**Figure 1** “Proposed location for the mangroves in Kep Province”



**Figure 2** “Proposed location of mangroves in Angkaol District”



**Figure 3** “Proposed location of mangroves in Prey Nob District”

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## Beneficiaries

Key beneficiaries include:

Beneficiaries	Reason	Quantity	Cost/ Beneficiary
Local Fishermen	<p>Improved fishing yields resulting from the improved marine ecosystem.</p> <p>As per the International Federation of Red Cross and Red Crescent Societies (IFRC) study dated 2011 <i>Mangrove plantation in Viet Nam: Measuring impact and cost benefit</i> mangroves have also had a positive impact on the provision of additional income for coastal communities through an increase in per hectare yield of aquaculture products such as shellfish and oyster by 209-789 per cent.</p>	1000	\$11.52
Protection of Local Infrastructure, Property and Residents	<p>Mangrove plantations provide protection against coastal erosion, salt water ingress to rice fields and protection of residents, infrastructure property against storm surges and other environmental impacts.</p> <p>As per the International Federation of Red Cross and Red Crescent Societies (IFRC) study dated 2011 <i>Mangrove plantation in Viet Nam: Measuring impact and cost benefit</i> mangroves can provide direct protective benefits between \$800 and \$3287 per Ha subject to site specific constraints.</p>	16,754	\$11.61

## BUDGET

### Mangrove Plantation

Location	Zone	Land Size (Ha)	Allocated Budget (\$US)(3)

Kep Province	Confirmed Mangrove Plantation Zones	12.84 Ha	\$13,803
	High probability of success mangrove plantation zones (1)	24.5 Ha	\$18,436
	Moderate probability of success mangrove plantation zone (2)	119.40 Ha	\$51,342
Prey Nob District	Confirmed Mangrove Plantation Zones	0 Ha	\$0.00
	High probability of success mangrove plantation zones (1)	129 Ha	\$97,072
Nursery Establishment Costs	Mangrove Nursery (\$25,000)	NA	\$28050
<b>TOTAL</b>		<b>285.74</b>	<b>\$208,704</b>

### Notes:

1. Assumed that only 70% of the mangroves zones that have a high probability of being suitable are confirmed during the implementation phase.
2. Assumed that only 40% of the mangroves zones that have a moderate probability of being suitable are confirmed during the implementation phase.
3. Assumed plantation cost is \$1075 per hectare (\$850 with a 26% augmentation due to inflation) in accordance with IFRC (International Federation of Red Cross and Red Crescent Societies) paper 'Mangrove plantation in Viet Nam: Measuring impact and cost benefit' (2011)
4. Mangrove Nursery Costs based on paper entitled Sinohin, V., & Bacongus, S. (2000). Establishing a mangrove nursery. SEAFDEC Asian Aquaculture, 22(1), 7-8, 28-30 and with 1998 costs inflated at 3% per year.

# DATA COLLECTION

## *Inputs*

The following inputs were used for the development of this proposed investment.:

- Consultations (refer to Part II, Section H – The Consultative Process)
- Site Photographs (Refer to section XXX)
- Historical mangrove studies ([See IFRC, 2011](#))

## *Consultations*

Consultations with the communes were undertaken to understand the impact of strong winds and flooding on the specific communes. The dates for relevant consultation sessions wherein vulnerability to strong winds and flooding hazards were identified are as follows:

- 16 October 2018 - Meeting with Dr. Vann Monyneath
- 17 October 2018 - Meeting with the Fisheries Administration, Kep Province
- 17 October 2018 - Meeting with Department of Environment, Kep Province
- 18 October 2018 - Meeting with the representatives of the target communes, Kep Province
- 22 October 2018 - Consultation with the Eight Communes of Prey Nob District

Key messages received from these consultation sessions are as follows:

- Consensus that the cutting down of mangrove has resulted in greater instances of salt water ingress into agricultural land and surface water;
- There is a clear understanding that mangroves provide substantial ecological and economic benefits (e.g. more robust fisheries and better protected agricultural land);
- Limited budget in local communes to support mangrove preservation education campaigns;
- In some areas, mangroves have been cut to enable the expansion of agricultural land. The Department of Environment has indicated that providing clear delineation between agricultural land and mangrove preservation zones (e.g. by construction of a road) has been very successful;
- In areas where mangroves have been removed there has been increased coastal erosion;
- On 18<sup>th</sup> October 2018 commune leaders in Kep Province indicated that 350-375m of mangrove is sought after to mitigate significant erosion of local beaches and prevent salt water ingress;
- On 16<sup>th</sup> October 2018 Kep Municipality requested an 8km mangrove plantation along the west-facing Prey Thom coast;
- Support for mangrove plantations and preservation of existing mangrove is consistent at all levels of government.

## *Site Records*

- Site visits and review of areas selected for potential mangrove sites have confirmed the following:

- Proposed sites for mangrove plantation are typically located at historical mangrove plantation locations and/or are located adjacent to existing mangrove plantations (refer to photo 1 as an example);
- Where reduced mangrove depths relative to agricultural plots were identified, salinisation issues are noted by local residents and commune leaders as more prevalent;
- Fishing community evident across all communes (refer to photos)

### *Studies*

Sinohin, V., & Bacongus, S. (2000). Establishing a mangrove nursery. SEAFDEC Asian Aquaculture

Technical Guidance Document for Mangrove Planting Permitting and Management Plan. EAD-TMBS-TG-01. The Environment Agency–Abu Dhabi (EAD).

Hanneke Van Lavieren, Mark Spalding. Securing the Future of Mangroves. United Nations University Institute for Water, Environment and Health

JICA Expert Team (2014). Technical Document 3 Mangrove Plantation Guideline. The Qurm Environmental Information Center Project

Spalding M, McIvor A, Tonneijck FH, Tol S and van Eijk P (2014) Mangroves for coastal defence. Guidelines for coastal managers & policy makers. Published by Wetlands International and The Nature Conservancy. 42 p

Clarke, A. and Johns, L. (2002) Mangrove Nurseries: Construction, Propagation and Planting: Fisheries Guidelines, Department of Primary Industries, Queensland, Fish Habitat Guideline FHG 004, 32 pp.

Kathiresan, K. (2003a). How do mangrove forests induce sedimentation? *Revista de Biologia Tropical*, 51(2) : 355-360.

Brian Kastl, Kong Kimsreng (2012). Study of Coastal Mangrove Forest Devastation and Channel Sedimentation: Community-based Solutions Koh Kong Province, Cambodia. International Union for Conservation of Nature (IUCN) - Building Coastal Resilience.

IFRC (2011). Mangrove plantation in Viet Nam: measuring impact and cost benefit. International Federation of Red Cross and Red Crescent Societies (IFRC)

## IMPLEMENTATION

### *Key Risks & Safeguarding Issues*

The Mangrove Planting Management Plan is required to ensure planting of mangroves is ecologically the most appropriate species for the site-specific location.

Mangrove plantations to be clearly identified as mangrove protected reserves to prevent any deforestation risks, this will also be included in the Mangrove Planting Management Plan

Refer to [Part II, Section K](#) and [Annex 3](#) for more information on safeguarding management.



## *Community Engagement*

Community to be directly engaged in plantation of mangroves.

Community and governing body to be educated in the benefits associated in the protection and propagation of mangroves. This linked to Output 1.3 of the project proposal

## *Construction*

Construction is anticipated to use largely unskilled labour, sourced from local communities.

An ecologist trained in mangrove ecology is to be involved in the development of the Mangrove Planting Management Plan, and may be required to supervise the planting to ensure optimum success. and during the implementation phases.

## *Design*

### *Stage 1 – Site Re-confirmation*

The project formulation selected sites based on physical features, land ownership and use, suitability, and absence of other barriers to plantation

Sites selected as part of this proposal (see maps, above) were selected as they passed initial screening processes and are deemed to have a high likelihood of success based on the criteria listed below:

- Land use & Ownership: Identified sites for mangrove plantation are classified as state public land. Some sites are noted as abandoned historic agricultural sites (likely abandoned due to inhospitability for agricultural crops due to proximity to coast – high winds and salt water ingress).
- Accessibility: Sites are physically accessible for plantation and maintenance.
- Topography: The site should be slightly sloping, draining tidal water back to the sea, unlike flat ground where the water stagnates. Suitable ground height level, usually at around mid-point of the tidal range is ideal for a mangrove plantation. The site should also be sheltered from strong winds and tidal currents that may seriously affect the survival and growth rate of mangrove saplings;
- Soil: Soil testing to bed should be undertaken to confirm that soil is well drained, aerated and either silty clay or sandy clay in nature. Some sites proposed around Angkoal are noted as having been historical salt farms, now abandoned. Soil salt concentrations are to be verified for all sites and confirmed as hospitable for mangrove plantations.
- Pressure: The site should be inaccessible to high numbers of grazing animals in its initial phases, and should be pollution-free in terms of household wastes, effluents, oil and other petroleum products and construction materials and rubble.
- Beneficiaries & Safeguards: All safeguarding principles should be adhered to and extent of potential beneficiaries maintained.

It is noted that during the implementation phase that sites will be surveyed, ground material suitability tested and land ownership re-confirmed for each individual plantation. Should a potential plantation area be confirmed as unviable for technical reasons and/or in breach of the safeguarding principles then an

alternate plantation site will be identified. This is highly unlikely however, based on the formulation work undertaken in the development of this proposal. By applying a probability of success for potential plantation sites during initial screening stages UN-Habitat are ensuring that in the event of a site being declared un-fit that an alternative location with comparable benefits can be secured.

#### *Stage 2 - Develop Mangrove Planting Management Plan:*

The Mangrove Planting Management Plan should outline:

- Site baseline features;
- Plantation site map;
- Plantation methods approach including, but not exclusive to:
- Assessment of optimum mangrove seedling spacing;
- Assessment of optimum seedling protection methods;
- Assessment of direct sowing method vs seedling transplantation method;
- Assessment of preferred mangrove seedling species based on site location;

*Note: Species Ipomoea pes-caprae (for planting adjacent to ocean front) & Rizophora mueronata (for planting in brackish water on the landward side) have been noted in other studies as suitable candidates for the Cambodian coastline.*

*Note: Coconut trees (Nypa fruticans) to be also considered where applicable to provide additional wind-breaks where adjacent to local housing and to buffer shorelines.*

- Justification for site selection and design
- Management plans for ensuring the community and government involvement in ongoing protection of mangrove zones;
- Establishing quantitative and measurable success criteria;
- Monitoring and reporting plan articulating project success vis-a-vis the success criteria. Plan to including reporting on lessons learned from both successes and failures:
- Detailed outline of project safeguards.
- Recommendations for replication and upscaling in other areas.

#### *Stage 3 - Approvals*

Submit Mangrove Planting Management Plan and attain formal approval from the Fisheries Administration of Kep and Preah Sihanouk Provinces for proposed plantations.

#### *Stage 4 - Planting & Monitoring*

Following approval of Mangrove Planting Management Plan planting and monitoring of seedlings to occur in accordance with the plan.

## PHOTOS



**Figure 1 - Typical mangrove plantation location. Sample site at Kep commune for proposed mangrove plantation (Coordinates 10°30'37.2"N 104°17'15.8"E).**



**Figure 2 - Example of thriving mangrove plantation within Kep Province (Coordinates 10°29'43.9"N 104°20'31.8"E)**



**Figure 3 - Example of thriving mangrove plantation within Prey Nob province (Coordinates 10°35'49.2"N 103°50'54.9"E)**



**Figure 4 - Prey Nob Fishing community (Coordinates 10°36'00.6"N 103°50'41.1"E)**



**Figure 5 – Kep Fishing Community, Angkaol Beach (Coordinates 0°27'29.2"N 104°22'59.3"E)**

## Environmental and Social Safeguards Screening

Environmental and Social Safeguard Principle	Risk Mitigation Actions incorporated in the design
<p><b><i>Compliance with the law</i></b> Projects/programmes supported by the Fund shall be in compliance with all applicable domestic and international law.</p>	<p>There are no anticipated legal issues</p>
<p><b><i>Access and Equity</i></b> Projects/programmes supported by the Fund shall provide fair and equitable access to benefits in a manner that is inclusive and does not impede access to basic health services, clean water and sanitation, energy, education, housing, safe and decent working conditions, and land rights. Projects/programmes should not exacerbate existing inequities, particularly with respect to marginalized or vulnerable groups.</p>	<p>The investment will deliver: improved resilience against salt water ingress for local agricultural plantations Improved protection against coastal erosion and associated land loss Improved safety for local houses against storm surges and other climate-related extremes Improved ecosystem conditions to support local marine environment and improve fish stock levels / sustainability</p> <p>This project will not exacerbate existing inequities. All proposed plantation locations are on state public that is not occupied by settlements.</p> <p>While access and equity issues are not anticipated, alternative locations are possible if safeguarding issues emerge in this area.</p>
<p><b><i>Marginalised and Vulnerable Groups</i></b> Projects/programmes supported by the Fund shall avoid imposing any disproportionate adverse impacts on marginalized and vulnerable groups including children, women and girls, the elderly, indigenous people, tribal groups, displaced people, refugees, people living with disabilities, and people living with HIV/AIDS. In screening any proposed project/programme, the implementing entities shall assess and consider particular impacts on marginalized and vulnerable groups.</p>	<p>There are no anticipated issues regarding marginalised groups as there is no potential for discrimination or favour in the protections offered by the mangrove plantations.</p>
<p><b><i>Human Rights</i></b></p>	<p>There are no anticipated issues regarding human rights as the mangroves are all proposed on land owned by the state.</p>

<p>Projects/programmes supported by the Fund shall respect and where applicable promote international human rights.</p>	
<p><b>Gender Equity and Women's Empowerment</b> Projects/programmes supported by the Fund shall be designed and implemented in such a way that both women and men 1) have equal opportunities to participate as per the Fund gender policy; 2) receive comparable social and economic benefits; and 3) do not suffer disproportionate adverse effects during the development process.</p>	<p>In the poor communities affected by the proposal it was observed that women tend to take more of a household and community management role and therefore they are likely to accrue greater long-term benefits from the community's improved fishing and crop yield, as they will be likely to take on the role of selling surplus outputs as well as the protections offered by mangrove. Men and women will be given equal opportunity to provide their labour to the planting process, under the <u>People's Process</u> approach</p>
<p><b>Core Labour Rights</b> Projects/programmes supported by the Fund shall meet the core labour standards as identified by the International Labour Organization.</p>	<p>There are no anticipated issues regarding core labour rights.</p> <p>Planting the mangrove will draw upon labour from the community. For further information about how core labour rights are protected under the People's Process approach, please see <a href="#">Part II Section K</a> of the Proposal and <a href="#">Annex 3</a></p>
<p><b>Indigenous People</b> The Fund shall not support projects/programmes that are inconsistent with the rights and responsibilities set forth in the UN Declaration on the Rights of Indigenous Peoples and other applicable international instruments relating to indigenous peoples.</p>	<p>There are no indigenous people in the target area</p>
<p><b>Involuntary Resettlement</b> Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids or minimizes the need for involuntary resettlement. When limited involuntary resettlement is unavoidable, due process should be observed so that displaced persons shall be informed of their rights, consulted on their options, and offered technically, economically, and socially feasible resettlement alternatives or fair and adequate compensation.</p>	<p>There is no resettlement required as a result of this investment.</p> <p>All proposed plantation locations are anticipated to be on state public land and not occupied by settlements.</p> <p>Numerous locations for proposed plantations have been nominated. Allowance has been made for alternative locations to be nominated should any land be occupied between the time of proposal formulation and the last site visit (October 2018) and the commencement of this investment.</p>

**Protection of Natural Habitat**

The Fund shall not support projects/programmes that would involve unjustified conversion or degradation of critical natural habitats, including those that are (a) legally protected; (b) officially proposed for protection; (c) recognized by authoritative sources for their high conservation value, including as critical habitat; or (d) recognized as protected by traditional or indigenous local communities.

This investment is expected to have a direct benefit with regard to protecting the natural habitat.

Mangrove plantations are to facilitate the creation of mangrove reserve and protection areas.

The Mangrove Planting Management Plan to ensure that selected mangroves for plantation are suitable for the environment and will support the local ecosystem.

**Conservation of Biological Diversity**

Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids any significant or unjustified reduction or loss of biological diversity or the introduction of known invasive species.

Mangrove Planting Management Plan to ensure that selected mangroves for plantation are suitable for the environment and will support the local ecosystem.

Material and seedlings imported to site will be environmentally screened to ensure that there are no invasive species brought to site.

Biological diversity is expected to improve as a direct benefit of this investment.

**Climate Change**

Projects/programmes supported by the Fund shall not result in any significant or unjustified increase in greenhouse gas emissions or other drivers of climate change.

The investment will help to offset the effects of climate change for the poor local communities. CO<sub>2</sub> emissions are expected to be mitigated due to this investment.

**Pollution Prevention and Resource Efficiency**

Projects/programmes supported by the Fund shall be designed and implemented in a way that meets applicable international standards for maximizing energy efficiency and minimizing material resource use, the production of wastes, and the release of pollutants.

This investment does not anticipate generating any waste of polluting materials.

**Public Health**

Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids potentially significant negative impacts on public health.

The investment should benefit public health by improving crop production. Some mangrove species have nutritional or health-giving properties and their fruits can be harvested. There are no anticipated negative effects.

**Physical and Cultural Heritage**

Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids the alteration, damage, or removal

There are no anticipated issues regarding physical and cultural heritage. For example, there are no sites of spiritual, religious or



of any physical cultural resources, cultural sites, and sites with unique natural values recognized as such at the community, national or international level. Projects/programmes should also not permanently interfere with existing access and use of such physical and cultural resources.

recreational importance in the proposed plantation zone.

**Land and Soil Conservation**

Projects/programmes supported by the Fund shall be designed and implemented in a way that promotes soil conservation and avoids degradation or conversion of productive lands or land that provides valuable ecosystem services.

This investment should reduce the instances of salinisation due to storm surges to agricultural fields and soil erosion.

## Output 3.2. WATER GATE REPAIR ANGKOAL AND PONG TUEK COMMUNES

### INTRODUCTION

Three irrigation canals from the main reservoirs O Thmar and Rhones are not functioning as per their design. The community is therefore unable to divide the water and get the right water levels and amounts of water to agricultural areas or use it for drinking purposes.



#### ***Problem statement***

The state of the current infrastructure means that the communities don't benefit from the existing water gates. Increasing periods of water shortage due to decreased rainfall as a result of climate change enhance the problem of a non-functional irrigation system. Rice farmers depending on this water source for irrigation and all those dependent on it for domestic water use are likely to face increasing problems with water shortages in the dry season in the near future, particularly considering rapidly declining rainfall in the dry season.

Resilience to natural hazards refers to the ability to protect lives, livelihoods and infrastructure from destruction or damage, and to the capability to restore normalcy after natural hazard has occurred. This

investment seeks to improve the resilience of the affected communes to the vulnerability of increasingly intense rainfall events and longer periods of draughts causing water shortage for cropping by repairing three water gates.

### **Location**



### **Beneficiaries**

The beneficiaries of this investment are the communities living in the area relying on water supply from the canals and dividing water by the water gates to water the rice paddies and other crops in the area.

- Commune
- Paddy field area

The community living and relying on this water source is 8,566 in Angkaol Commune and 10,987 in Pong Tuek Commune. The area of paddy field benefiting repair of these gates is approximately 600 hectares for water gate 1, 130 hectares for water gate 2 and 230 hectares for water gate 3. The locations of the gates are indicated on the map above.

## BUDGET

### *Gate repair Angkaol and Pong Teuk*

The estimated costs of the gate repairs are presented below.

Description	Quantity	Unit Price	Cost
Concrete gate 1	4.2 m <sup>3</sup>	\$104	\$440
Gate with plate and spindle including frame	1	\$3500	\$3500
Filling material gate 1	6 m <sup>3</sup>	\$6.5	\$39
Concrete gate 2	1 m <sup>3</sup>	\$104	\$104
Filling material gate 2	3 m <sup>3</sup>	\$6.5	\$19.50
Concrete gate 3	3 m <sup>3</sup>	\$104	\$310
Sandbags needed for construction all gates	15 m <sup>3</sup>	\$13	\$195
Labour	20 days	\$15	\$300
Labour skilled	10 days	\$30	\$300
Pump to drain work space	1	\$120	\$120
<b>TOTAL</b>			<b>\$5,327.50</b>

## DATA COLLECTION

### *Inputs*

The newly designed or adjusted gates will be in line with the currently installed systems throughout Cambodia. The following data input is used to assess the gate repair plan for Angkoal and Pong Teuk Communes

Irrigation water productivity in Cambodian Rice System, 2011, C. Wokker, P. Santos, B. Ros and K. Griffiths. CDRI publication

Climate-resilient irrigation guidance paper, 2014. Coastal Adaptation and Resilience Planning Component, Cambodia Climate Change Alliance (CCCA)

### *Consultations*

The following government agencies/organizations were consulted on the water gates.

- The Ministry of Environment in Phnom Penh pointed out that field data needed to be obtained by visiting the gates and reservoirs.
- The Department of Water Resources and Meteorology, Kep Province pointed out that there are 10 reservoirs in Kep Province. Not all of them are functioning effectively. Roness reservoir is not functioning at all, since the structure is too fragile to store water. The O Thmar reservoir is silted up and therefore is not able to store enough water. The gates downstream of O Thmar cause problems, making water division to the downstream communities difficult. Works to improve the functionality of these two reservoirs are described in outputs 3.4 and 3.4b.

The chief of Angkoal Commune pointed out that these gates need to be repaired because they cannot be operated properly due to the current state of the structures. A site visit then took place that made the following observations:

### *Site Records*

During the site visit it became clear that the downstream gates of O Thmar are damaged and therefore need to be repaired.

The gates that need repair are:

**Figure 1 “Watergate 1 in Pong Teuk Commune”**





**Figure 2** *“Watergate 2 eroding embankment upstream and downstream embankment in Angkaol Commune”*

Details on water gates:

- Watergate 1 is missing the spindles and gate and the surrounding embankment is eroded
- Watergate 2 is suffering from erosion at the embankment both upstream and downstream
- Watergate 3 is having trouble due to scour on the gate bottom



**Figure 3** “Watergate 3 scour underneath the water gate in Angkaol Commune”

## IMPLEMENTATION

### *Design*

The gates designs are standard for the area and seen throughout the province. The repair works are detailed per water gate. Mostly focusing on concrete works and precautions to prevent erosion.

### *Gate 1*

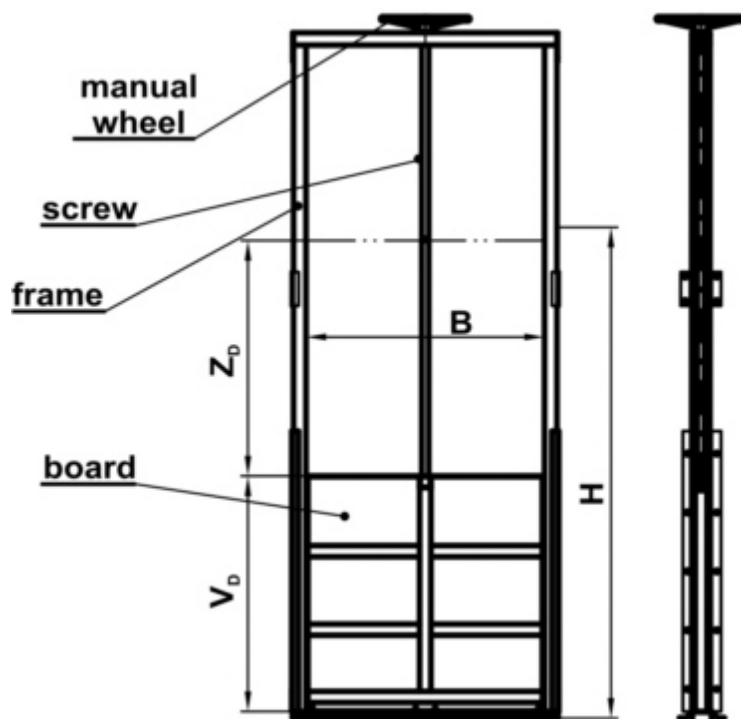


Repair works on water gate one are slightly more comprehensive than the other gates. Water gate 1 needs a proper structure provided before two new spindles can be installed. To do so, the upper structure needs to be built with concrete and the also the lining around the gate, guiding the water, requires reconstruction.



**Figure 4** *“Missing spindle in gate 1”*

The frame supporting the spindles can be installed in the concrete frame, similar to the existing gates (figure 2). The dimensions for one of the two spindles and gate board is given in Table 1. In Figure 5 the dimensions represented in the table match the standard design.

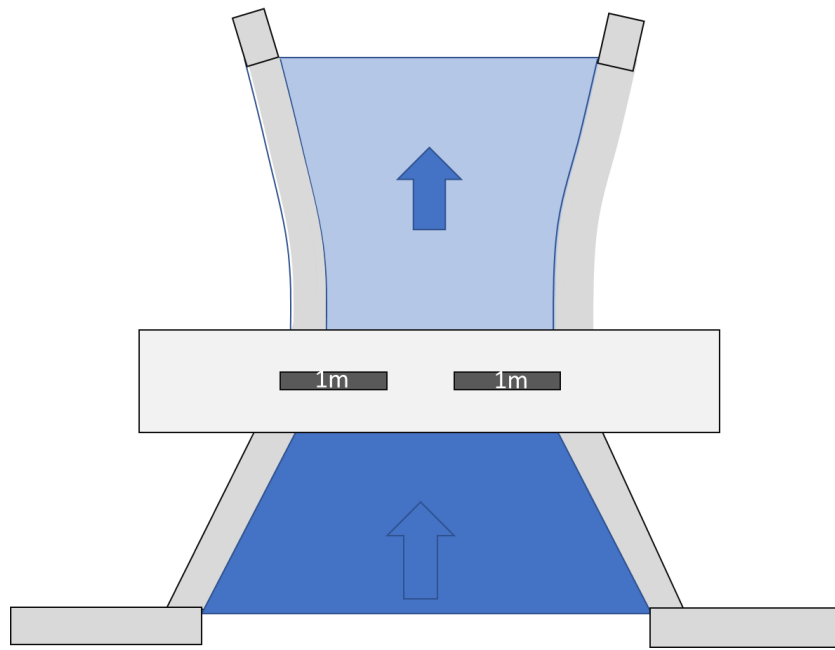


**Figure 5 “Spindle design standard”**

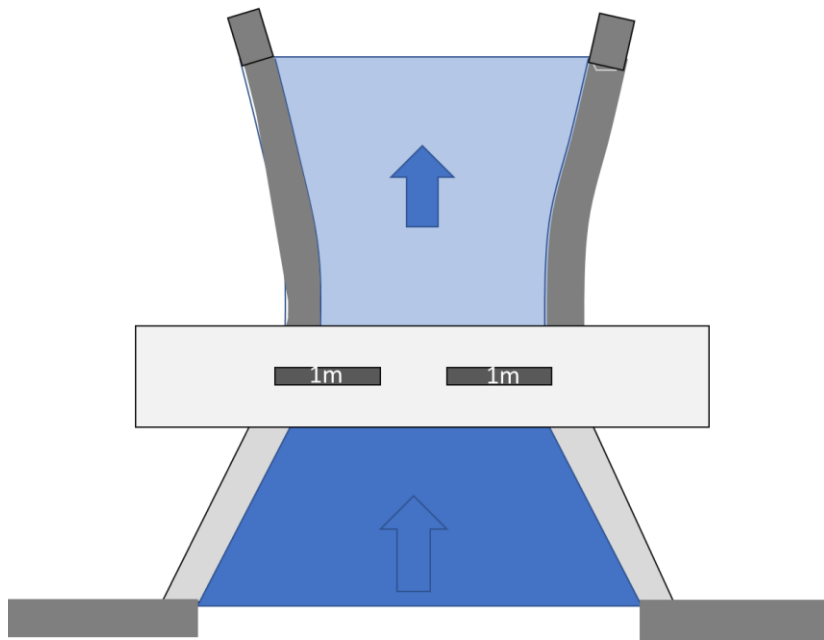
*Table 1 Dimensions spindle and board structure*

Design Standard		Unit	Dimensions
Board Height	$V_D$	m	
Board Width	$B$	m	1
Frame Height	$B$	m	3

Work on the embankment on gate 1 includes adding material to prevent from eroding. The concrete sides need to be rehabilitated with concrete and filling material.



**Figure 6** “Top view concrete water gate embankment”



**Figure 7** “Concrete lining in dark grey needs repair for Gate 2”

The concrete thickness of the embankment is estimated to be 15 cm.

#### *Gate 2*

The concrete lining of the embankment for water gate 2 needs to be repaired. Figure 5 gives the concrete lining that needs to be constructed. The concrete guiding the water towards the gate is in place already. The concrete in line with the gates is missing, therefore the embankment upstream and downstream is eroding.

#### *Gate 3*

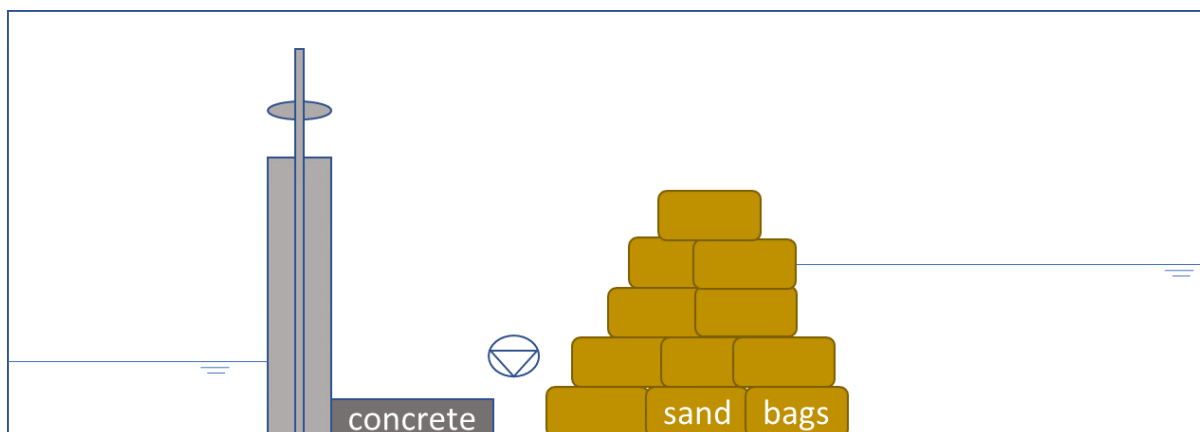
This gate has problems with scour. The concrete under the gate is eroding therefore water is passing underneath the gate causing more erosion on the foundation of the structure.

### ***Community Engagement***

Community engagement will be necessary to prevent the gates from clogging with solid waste. Capacity building on gate and canals management is described in the investment regarding the relining of the canals. For this reason, the activities under Component 1, Output 1.1 have been proposed. Further information on the community consultations that have taken place can be found in [Part II, Section H](#) of the proposal.

### ***Construction***

The construction of the concrete base of gate 3 can be carried out applying the method as depicted in the figure below. Sandbags are used in combination with a pump to block the upstream water flowing in. The pump takes out the water that is seeping in. The gate is closed so water cannot flow backwards. In case the water cannot be stopped by the gate from flowing back completely sandbags can be applied on the downstream side of the gate equally. The method can be used for all three of the gate repair tasks.



**Figure 8** “Construction drawing concrete works”

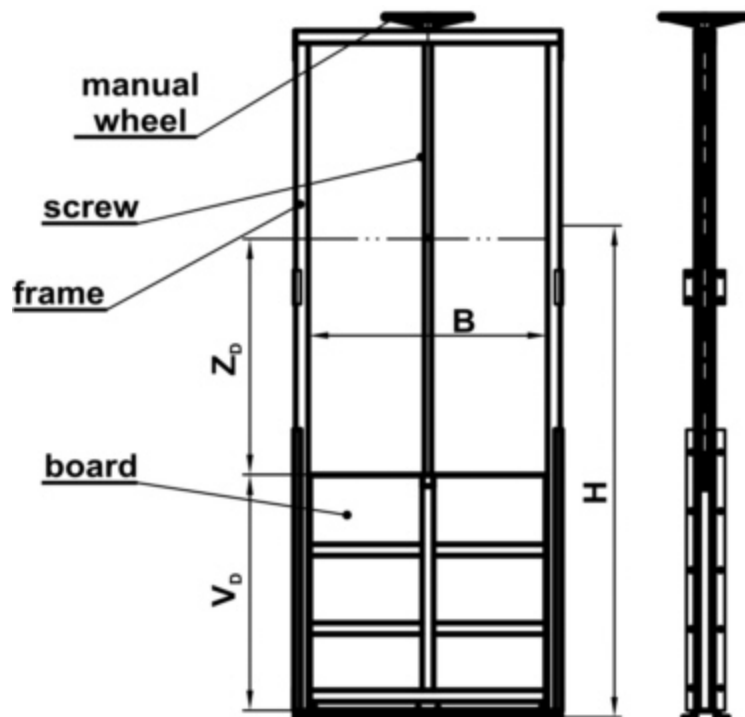
#### **Contractor Requirements**

The contractor needs to be able to deliver laborer’s that are skilled to work with concrete. The work can best be carried out in the dry season therefore less pumping and sandbags are needed. Sandbags can be used on all the locations.

#### **Key Risks & Safeguarding Issues**

The repair works take part on existing infrastructure, are requested by the local community, therefore the no risks on social safeguarding issues are applicable in for this investment. However, further information of environmental and social safeguards can be found in [Part II, Section K](#) of the proposal.

## TECHNICAL DRAWINGS



**Figure 9** “Design water gate standard applied throughout coastal area”

## PHOTOS



*Figure 10* “Water gate 3”



*Figure 11* “Downstream from water gate 3”



*Figure 12 “Canal downstream from water gate 3”*



*Figure 13 “Canal downstream water gate 3”*





*Figure 14 “Erosion upstream water gate 1”*



*Figure 15 “Erosion embankments water gate 1”*



**Figure 16** “Missing gate = water gate 1”



**Figure 17** “Eroded embankments around water gate 1”

<b>Environmental and Social Safeguard Principle</b>	<b>Risk Mitigation Actions incorporated in the design</b>
<p><b>Compliance with the law</b> Projects/programmes supported by the Fund shall be in compliance with all applicable domestic and international law.</p>	<p>The waterbodies and gates are all state public land.</p>
<p><b>Access and Equity</b> Projects/programmes supported by the Fund shall provide fair and equitable access to benefits in a manner that is inclusive and does not impede access to basic health services, clean water and sanitation, energy, education, housing, safe and decent working conditions, and land rights. Projects/programmes should not exacerbate existing inequities, particularly with respect to marginalized or vulnerable groups.</p>	<p>The repair on the gate will improving the access to water to the community. The gates make it possible to have controlled waterflow and thereby improve the existing water system. Because the water bodies are all public land, it is expected that the water will be a 'public good' whereby it will not be possible to prevent individuals or groups from using it. Indeed, it will enhance the ability of all target beneficiaries to access water.</p>
<p><b>Marginalised and Vulnerable Groups</b> Projects/programmes supported by the Fund shall avoid imposing any disproportionate adverse impacts on marginalized and vulnerable groups including children, women and girls, the elderly, indigenous people, tribal groups, displaced people, refugees, people living with disabilities, and people living with HIV/AIDS. In screening any proposed project/programme, the implementing entities shall assess and consider particular impacts on marginalized and vulnerable groups.</p>	<p>The improvements on the water system will not marginalise vulnerable groups.</p>
<p><b>Human Rights</b> Projects/programmes supported by the Fund shall respect and where applicable promote international human rights.</p>	<p>There is no possibility that human rights will be violated. The gates improve the ability of the beneficiaries to access water</p>
<p><b>Gender Equity and Women's Empowerment</b> Projects/programmes supported by the Fund shall be designed and implemented in such a way that both women and men 1) have equal opportunities to participate as per the Fund gender policy; 2) receive comparable social and economic benefits; and 3) do not suffer disproportionate adverse effects during the development process.</p>	<p>The water dividing gate will benefit both men and woman equally.</p>
<p><b>Core Labour Rights</b></p>	<p>Safety equipment will be required for workers on the site. For further general information on</p>

<p>Projects/programmes supported by the Fund shall meet the core labour standards as identified by the International Labour Organization.</p>	<p>Core Labour Rights as part of the Environmental and Social Safeguard approach of the project, please refer to the proposal document, <a href="#">Part II, Section K</a>.</p>
<p><b>Indigenous People</b> The Fund shall not support projects/programmes that are inconsistent with the rights and responsibilities set forth in the UN Declaration on the Rights of Indigenous Peoples and other applicable international instruments relating to indigenous peoples.</p>	<p>The gate repair does not influence the UN Declaration on the Rights of Indigenous Peoples. There are no reports on current gate operations excluding certain areas or indigenous people.</p>
<p><b>Involuntary Resettlement</b> Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids or minimizes the need for involuntary resettlement. When limited involuntary resettlement is unavoidable, due process should be observed so that displaced persons shall be informed of their rights, consulted on their options, and offered technically, economically, and socially feasible resettlement alternatives or fair and adequate compensation.</p>	<p>The works all involve work on public state-owned land. Therefore, no resettlement of any type is required.</p>
<p><b>Protection of Natural Habitat</b> The Fund shall not support projects/programmes that would involve unjustified conversion or degradation of critical natural habitats, including those that are (a) legally protected; (b) officially proposed for protection; (c) recognized by authoritative sources for their high conservation value, including as critical habitat; or (d) recognized as protected by traditional or indigenous local communities.</p>	<p>The area where the gates are constructed is solely agricultural land. No natural habitat is endangered by the gate repair works.</p>
<p><b>Conservation of Biological Diversity</b> Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids any significant or unjustified reduction or loss of biological diversity or the introduction of known invasive species.</p>	<p>There are no risks on the decrease of biological diversity. The works are all located on sites where infrastructure already exists. Improved downstream water has the potential to boost aquatic biodiversity.</p>
<p><b>Climate Change</b> Projects/programmes supported by the Fund shall not result in any significant or unjustified increase in greenhouse gas emissions or other drivers of climate change.</p>	<p>The construction of the gates will involve steel and concrete, as well as transportation, and the associated emissions involved with that. However, once in operation, the gates will not cause any GHG emissions.</p>

<p><b>Pollution Prevention and Resource Efficiency</b> Projects/programmes supported by the Fund shall be designed and implemented in a way that meets applicable international standards for maximizing energy efficiency and minimizing material resource use, the production of wastes, and the release of pollutants.</p>	<p>Resource efficiency is improved by the installation of the gate and repair of the other two structures. Possibilities to divide the water makes the communes more resilient to longer periods of draught with more efficient resource management.</p>
<p><b>Public Health</b> Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids potentially significant negative impacts on public health.</p>	<p>The storage of fresh water increases the access to fresh water, which is beneficial to public health.</p>
<p><b>Physical and Cultural Heritage</b> Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids the alteration, damage, or removal of any physical cultural resources, cultural sites, and sites with unique natural values recognized as such at the community, national or international level. Projects/programmes should also not permanently interfere with existing access and use of such physical and cultural resources.</p>	<p>The gate repair does not harm cultural heritage. There are no sites of cultural, spiritual or religious heritage in or around the gates or their adjoining canals.</p>
<p><b>Land and Soil Conservation</b> Projects/programmes supported by the Fund shall be designed and implemented in a way that promotes soil conservation and avoids degradation or conversion of productive lands or land that provides valuable ecosystem services.</p>	<p>The installation of the gates provides an increased supply of fresh water. Making the land more resilient to salt water ingress preventing from soil degradation.</p>



## 3.2B PONG TEUK AND ANGKAOL CANALS REHABILITATION

*Pong Teuk and Angkaol Communes*

### INTRODUCTION

Pong Teuk and Angkaol Communes both have been affected by fluvial flooding due a lack of drainage capacity. Reservoirs in the communities are not well operated and the canals are silted up, which causes the capacity shortage. Besides draining during wet conditions, the canals provide an irrigation function for the rice paddy fields in the area. These canals therefore have the potential to provide year-round functionality – drainage in the rainy season and water for irrigation and domestic use in the dry season.

The canal downstream from Roness Reservoir is silted up and needs re-lining to prevent flooding in wet periods. The canals downstream from O Thmar reservoir are overgrown by vegetation as seen in the picture above.



## ***Problem statement***

Poorly maintained canals have limitations in discharge capacity therefore cause flooding in the wet season. On the other end in the dry season water designated to an area is vital for its rice production. Losses due to bad water canal management causes water shortages and crop failures in periods of drought, which are likely to become more common as a result of declining rainfall due to climate change. The communities need a more resilient approach to water management allowing them to:

Resilience to natural hazards refers to the ability to protect lives, livelihoods and infrastructure from destruction and damage, and to the capability to restore areas after natural hazard has occurred. This project seeks to improve the resilience of the affected communes to the vulnerability low discharge capacity due to silted canals by the provision of:

- Canal maintenance and re-lining of the most silted up canals
- Capacity building on canal maintenance.



## Location

The location of the irrigation channels is situated in Kep Province for both Angkaol and Pong Teuk Communes. The maps below show the locations of the canals.



**Map 1** “Angkaol Commune Canals for Rehabilitation”



**Map 2** “Pong Teuk Canal Rehabilitation location”

### ***Beneficiaries***

The group benefiting from these infrastructures is combined farmers and villagers who depend on the water as a source and the upstream living communes who rely on the canals to function as drains which discharge the excess of rainwater. The group of beneficiaries is described in detail in section 3.2a – the same people will benefit from activities under output 3.2a and 3.2b.

# BUDGET

## *Canal Rehabilitation*

The cost of the canal rehabilitation is based on the total length of the three canals combined. The total length is 8,600 meters. Taking out debris with an excavator counts for the largest cost in rehabilitation of the canals. Taking out the debris can also be done by hand, using a large amount of unskilled labour. This will take more time. It is recommended in this investment to get the debris out with an excavator and start an education programme on canal maintenance. Training on canal maintenance will be undertaken as part of Output 1.3

Description	Quantity	Unit Price	Cost
Taking out debris	8600m <sup>3</sup>	\$6	\$51,000
Labour (unskilled)	250 days	15	\$3,750
Labour (skilled)	60 days	30	\$1,800
Equipment	500hr	39	\$19,500
TOTAL			\$76,050

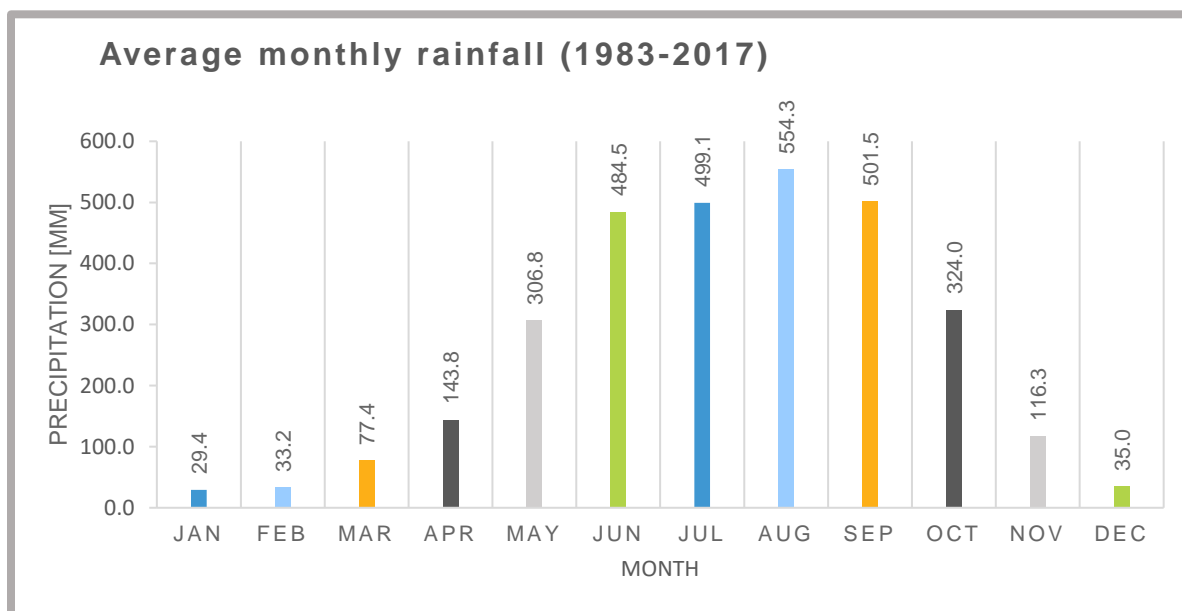
## DATA COLLECTION

### *Inputs*

Rehabilitation of the canals is based on the information collected during the field visit. Visual inspections showed a lack of maintenance of the canals, causing blockages of major structures such as culverts and gates. The canals should be designed based on the discharge capacity set by the orifices and sluice in the irrigation system. Visual inspection shows the following dimensions for the orifices and sluices in the O Thmar and Roness Reservoir. The canals therefore need to be designed on the maximum discharge capacity of the sluices.

	Sluice Gate 1 South O Thmar Reservoir	Sluice Gate 2 East O Thmar Reservoir	Sluice Gate Rhones Reservoir
Head loss [H1]	3 m	3 m	1 m
Width	1 m	2 m	2 x 1.5 m
Height [W]	1.5 m	1.5m	1 m
Maximum discharge wet season[Q]	6.7 m3/s	12.5 m3/s	3.4 m3/s

Rainfall data is essential in understanding the behaviour of the water system. the graph below shows the averages rainfall per month for the last 34 years in nearby Sihanoukville. Over 85% of annual rainfall occurs in the rainy season from June to October.



**Figure 1** “Average monthly rainfall between 1983-2017 in Sihanoukville”

Based on this information we can conclude that in the dry season flows are limited to the availability of water left in the reservoir. This flow needs to be directed to the rice paddies using efficient methods – this will be supported by more effective functioning of the three targeted canals in this activity.

### *Consultations*

The following governmental organizations and communities were consulted about the activities described under output 3.2b

17-10-2018 – Kep Province Department of Meteorology and Water Resources

18-10-2018 – Angkaol Commune

19-10-2018 – Pong Teuk Commune

Further information on the consultations undertaken to form the proposal can be found in [Part II, Section H](#).

### *Site Records*

The canals in Angkaol Commune were shown to the proposal formulation team us by the Deputy Commune Chief. She pointed out to us that the canals are not functioning as they are supposed to. The water system is largely silted and mostly overgrown by vegetation. Providing rehabilitation of the canals in combination with an education programme such as that proposed under Component 1, output of the project can increase the resilience of the commune to flood and drought.

The canals in Pong Teuk Commune suffer from a different kind of siltation, the canals and streams in Pong Teuk are covered in solid waste. The solid waste is blocking culverts and bridges, causing floods when high water levels occur. The investment in Pong Teuk will focus on capacity building on solid waste management and canal maintenance. The streams will benefit significantly from removing the solid waste. Structural canal rehabilitation as proposed for Angkaol Commune isn't appropriate for the streams and waterways in Pong Teuk. The waterways are more natural and therefore more difficult to line. Education on maintenance of natural streams and solid waste management is therefore a more efficient approach for Pong Teuk Commune. Education on solid waste management is provided in Output 1.3 of the project.

## IMPLEMENTATION

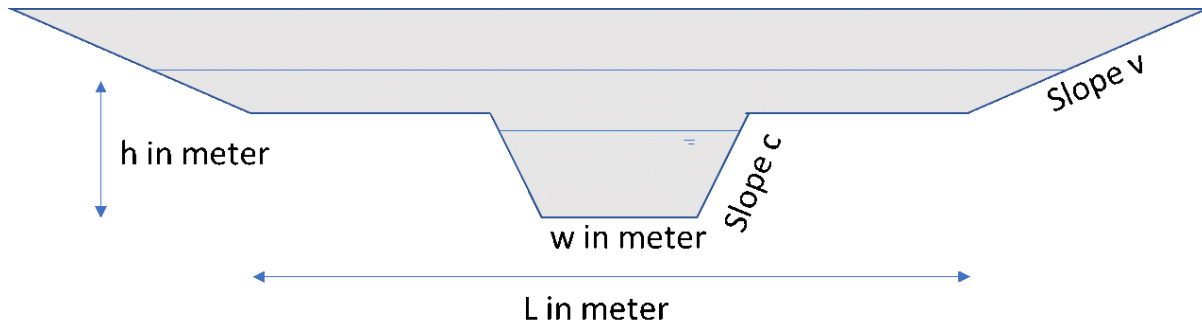
### *Design*

The channels will be shaped like the picture below. A small area for the discharge in the dry season and widening top for maximum flow capacities which occur in the wet season.

Given the discharges generated by the sluice gates at maximum discharge capacity.

The channel slopes on both sides are preferably 1:5 and the deepened part has a slope of 1:3.

The discharge in the dry season is estimated at 1 m<sup>3</sup>/s using a manning roughness coefficient of 0.035 for natural canals, results in a width of 0.5 m, and a water level height of 0.6 for the sluices near O Thmar. The Roness downstream flow is estimated slightly greater, resulting in a bottom width of 1m and 0.65m water level.



**Figure 2** “Cross section canal periductular to flow direction”

The canal design derived from the maximum discharge capacity is given in the table below.

	Canal 1 O Thmar South Sluice	Canal 2 O'thmar East Sluice	Canal 3 A,B Roness Downstream
Wet season discharge Q [m <sup>3</sup> /s]	6.7	12.5	13.4
Wet season bottom width L [m]	4	6	6
Bottom width w [m]	0.5	0.5	1
Slope c [m/m]	1/3	1/3	1/3
Slope v [m/m]	1/5	1/5	1/3
Water level h [m]	1.2	1.40	1.4

### *Community Engagement*

The community engagement in the water resources management on canal maintenance is particularly essential to those benefiting from this source. Maintenance on the canals will provide two main measures to become more climate adaptable. First one is the maintaining of the canals will include the removal of vegetation in and around the stream. By doing this the canal is suitable for bigger discharge volumes and therefore flooding will occur less regularly. The second advantage of the maintenance accounts for periods of low discharge volumes. In this state the infiltration and evaporation losses should be kept minimal to provide the water to the crops in the most efficient way. Removing debris, vegetation and lining the canals will improve the efficiency of water transport.

The canal rehabilitation programme is part of the capacity building subject in the proposal. Capacity building for both communities should facilitate:

- Training in solid waste management
- Training in canal maintenance combined with education on the functioning of the water system.

### *Construction*

The following aspects need to be taken in to consideration before executing the work.

- Work needs to be done between to cropping cycles to secure water for crops
- The soil work can best be done in the dry season, to prevent washing out of extra sediments and guarantee access to any equipment.

- The majority of the work can be done with unskilled workers.

### *Contractor Requirements*

The contractor should take into account international safety and labour regulations. For more information of the environmental and social safeguard requirements, see [Part II, Section K](#) of the Proposal, [Annex 3](#), and the activity screening, below

### *Key Risks & Safeguarding Issues*

The safeguarding issues are added in the table on the last page of this project sheet. One of the considerations is the accessibility of the canals to be restored, possibly access over third-party property is required. The canals itself on the other hand are situated on public land.

While rehabilitating the canals, this should be done one part at the time to allow migration of fishes and other water animals in the canal. If the discharge is continued during rehabilitation risks to damaging biodiversity can be limited.

## TECHNICAL DRAWINGS

The calculation on the maximum discharge capacity (table 1) generated by the sluice gates is done by the following equation. The value used for K is highlighted in blue.



**Figure 3** “Head loss over sluice gate with  $w$  indicating the sluice gate height in m and  $H_1$  the water level above in m”

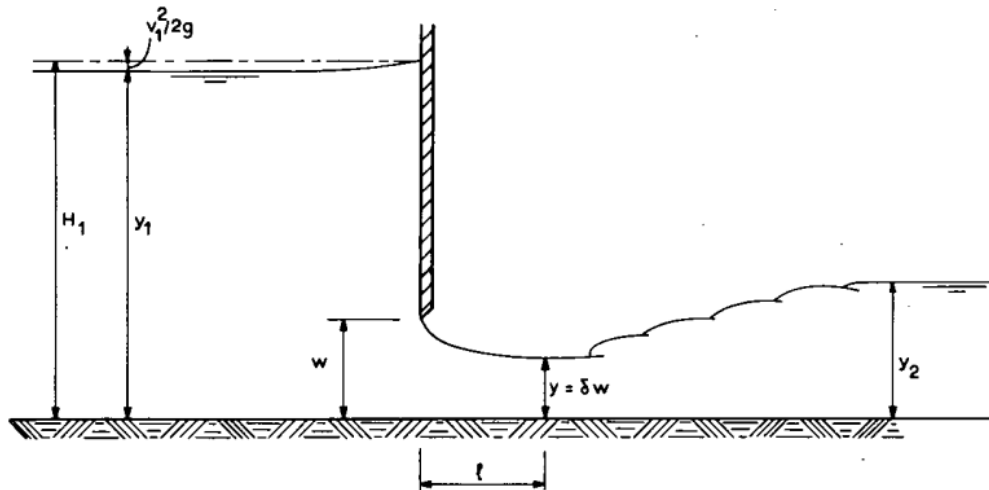
$$Q = K b_c w^{1.5} \sqrt{2g} = A w^{0.5} K \sqrt{2g} \quad (8-7)$$

where the coefficient  $K$  is a function of the ratio  $n = y_1/w$  as shown in Table 8.3.

Table 8.3 Coefficients for free flow below a sluice gate

Ratio	Contraction coefficient	Discharge coefficient	Coefficient	$K\sqrt{2g}$
$n = y_1/w$	$\delta$	$C_d$	$K$	$m^{1/2} s^{-1}$
1.50	0.648	0.600	0.614	2.720
1.60	0.642	0.599	0.641	2.838
1.70	0.637	0.598	0.665	2.946
1.80	0.634	0.597	0.689	3.052
1.90	0.632	0.597	0.713	3.159
2.00	0.630	0.596	0.735	3.255
2.20	0.628	0.596	0.780	3.453
2.40	0.626	0.596	0.823	3.643
2.80	0.625	0.598	0.905	4.010
3.00	0.625	0.599	0.944	4.183
3.50	0.625	0.602	1.038	4.597
4.00	0.624	0.604	1.124	4.977
4.50	0.624	0.605	1.204	5.331
5.00	0.624	0.607	1.279	5.664

Adapted from Franke 1968



## PHOTOS



**Figure 4** “Orifices 1 southern irrigation branch O Thmar Reservoir”



**Figure 5** “Canal 1 situation downstream from O Thmar Reservoir”



**Figure 6** “Canal 1 close to second water gate after downstream O Thmar sluice gate”



**Figure 7** “Double sluice gate east O Thmar Reservoir”



**Figure 8** *“Silted canal downstream double sluice gate east of O Thmar Reservoir”*



**Figure 9** *Canal 5 downstream from Rolles Reservoir*



*Figure 10 “Pong Teuk solid waste in natural stream”*

Environmental and Social Safeguard Principle	Risk Mitigation Actions incorporated in the design
<p><b>Compliance with the law</b> Projects/programmes supported by the Fund shall be in compliance with all applicable domestic and international law.</p>	<p>The waterbodies are public land by law. Therefore, no interference with domestic or international law is at stake.</p>
<p><b>Access and Equity</b> Projects/programmes supported by the Fund shall provide fair and equitable access to benefits in a manner that is inclusive and does not impede access to basic health services, clean water and sanitation, energy, education, housing, safe and decent working conditions, and land rights. Projects/programmes should not exacerbate existing inequities, particularly with respect to marginalized or vulnerable groups.</p>	<p>The canal rehabilitation improves the water supply to the commune. With the capacity building programme included the community can benefit from the rehabilitation even more by maintaining the shape of the canals. The program and the rehabilitation will not affect access and equity principles. The canals will not be privatised and there will be no barrier to any community members' benefit from them.</p>
<p><b>Marginalised and Vulnerable Groups</b> Projects/programmes supported by the Fund shall avoid imposing any disproportionate adverse impacts on marginalized and vulnerable groups including children, women and girls, the elderly, indigenous people, tribal groups, displaced people, refugees, people living with disabilities, and people living with HIV/AIDS. In screening any proposed project/programme, the implementing entities shall assess and consider particular impacts on marginalized and vulnerable groups.</p>	<p>The improvements on the water system will not marginalise vulnerable groups.</p>
<p><b>Human Rights</b> Projects/programmes supported by the Fund shall respect and where applicable promote international human rights.</p>	<p>Neither the capacity building programme nor the rehabilitation of the canals will conflict with human rights.</p>
<p><b>Gender Equity and Women's Empowerment</b> Projects/programmes supported by the Fund shall be designed and implemented in such a way that both women and men 1) have equal opportunities to participate as per the Fund gender policy; 2) receive comparable social and economic benefits; and 3) do not suffer disproportionate adverse effects during the development process.</p>	<p>The improved water management system will benefit both men and woman.</p>

**Core Labour Rights**

Projects/programmes supported by the Fund shall meet the core labour standards as identified by the International Labour Organization.

Maintenance work needs to be done according to the standards. The contractor required to the job needs to fulfil these requirements. Further information can be found in the proposal in [Part II, Section K](#).

**Indigenous People**

The Fund shall not support projects/programmes that are inconsistent with the rights and responsibilities set forth in the UN Declaration on the Rights of Indigenous Peoples and other applicable international instruments relating to indigenous peoples.

The gate repair does not influence the UN Declaration on the Rights of Indigenous Peoples. There are no reports on operations excluding certain areas or indigenous people.

**Involuntary Resettlement**

Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids or minimizes the need for involuntary resettlement. When limited involuntary resettlement is unavoidable, due process should be observed so that displaced persons shall be informed of their rights, consulted on their options, and offered technically, economically, and socially feasible resettlement alternatives or fair and adequate compensation.

The works all involve work on public state owned land. Therefore, no involuntary resettlement is required. No one is currently occupying the land that is being used, and the repair work on the canals will not involve flooding or any other displacement that could force the resettlement of nearby people.

**Protection of Natural Habitat**

The Fund shall not support projects/programmes that would involve unjustified conversion or degradation of critical natural habitats, including those that are (a) legally protected; (b) officially proposed for protection; (c) recognized by authoritative sources for their high conservation value, including as critical habitat; or (d) recognized as protected by traditional or indigenous local communities.

The area where the gates are constructed is solely agricultural land. No natural habitat is endangered by canal repair works. Although accessing the terrain temporarily might be crossing private property. To prevent damage to crops, rehabilitation work needs to be planned in between cropping cycles.

**Conservation of Biological Diversity**

Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids any significant or unjustified reduction or loss of biological diversity or the introduction of known invasive species.

Rehabilitation of the canals can cause temporarily disturbance of species living in the canals. By doing the work in section and keeping the water flow at all times will limit the damage to species.

**Climate Change**

Projects/programmes supported by the Fund shall not result in any significant or unjustified

The rehabilitation of the canals will increase the resilience to flooding in the area, because the discharge capacity is increased. While the

<p>increase in greenhouse gas emissions or other drivers of climate change.</p>	<p>works will involve some equipment transportation, the operation of the canals will not involve any GHG emissions.</p>
<p><b>Pollution Prevention and Resource Efficiency</b> Projects/programmes supported by the Fund shall be designed and implemented in a way that meets applicable international standards for maximizing energy efficiency and minimizing material resource use, the production of wastes, and the release of pollutants.</p>	<p>Resource efficiency is improved by relining the canals. The larger discharge capacity makes the commune less vulnerable to climate change and allows for more efficient resource management.</p>
<p><b>Public Health</b> Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids potentially significant negative impacts on public health.</p>	<p>The rehabilitation of the canals prevents flooding, therefore reduces chances of negative effects on public health by reducing the spread of contaminated water.</p>
<p><b>Physical and Cultural Heritage</b> Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids the alteration, damage, or removal of any physical cultural resources, cultural sites, and sites with unique natural values recognized as such at the community, national or international level. Projects/programmes should also not permanently interfere with existing access and use of such physical and cultural resources.</p>	<p>No cultural heritage is influenced by these works.</p>
<p><b>Land and Soil Conservation</b> Projects/programmes supported by the Fund shall be designed and implemented in a way that promotes soil conservation and avoids degradation or conversion of productive lands or land that provides valuable ecosystem services.</p>	<p>Rehabilitation of the canals increases the area that potentially can be irrigated and used as fertile ground for the community.</p>





## 3.4a. O THMAR RESERVOIR CAPACITY IMPROVEMENT

*Investment ID: 3.4a*

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### INTRODUCTION



<b>Deliverables</b>	<ul style="list-style-type: none"> <li>• Remove islands and silt to improve storage capacity</li> <li>• Engineer’s inspection to verify safety of dam</li> <li>• Ground investigation of excavated material to determine suitability for re-use</li> </ul>
<b>Beneficiaries</b>	14,060
<b>Budget</b>	US\$ 649,340
<b>Location</b>	Protects Angkaol and Pong Teuk communes, also may provide benefits to neighbouring Kampot Province

The O Thmar reservoir holds water for approximately 600 ha of paddy field in Kep Province. Besides Kep province, the reservoir also supplies water to part of neighbouring Kampot Province. O Thmar reservoir is connected upstream to Roness Reservoir, and also has a separate supply catchment from the north. Both these reservoirs date from the Khmer Rouge era (1975-1979). However, Roness is in poor condition and doesn’t function properly. Therefore, the retained water level in Roness is kept low and a large amount of water from Roness’ catchment directly discharges to O Thmar Reservoir. The two reservoirs are connected by a small canal, making O Thmar a more significant water storage facility for the area. O Thmar is in generally better condition than Roness, having undergone a refurbishment and upgrade in 2003-4, and retains water at full design depth at the present time.

**Problem statement**

35 years of meteorology data recorded further west along the coast at Sihanoukville indicate a steeply decreasing trend in average annual rainfall since 1983. Climate change projections (cited in the Report on Shoreline Assessment on Climate Change, Cambodia Ministry of Environment) indicate this trend will continue in the coastal area of Cambodia. Storing fresh water will become more important for the coastal areas to reduce the risk of sea water intrusion and therefore salinization affecting crops and people’s ability to produce sufficient food. Creating more storage in the O Thmar Reservoir is one of the measures therefore that can support climate change adaptation in Kep Province.

The theoretical capacity of O Thmar Reservoir cannot be fully used, due the presence of islands and areas of higher ground within the reservoir footprint, which limit the storage capacity of the reservoir. There is also significant encroachment of vegetation within the reservoir. With storage capacity limited, the reservoir doesn’t provide enough water for agriculture in the dry season. If the islands are removed from O Thmar and the storage capacity raised without increasing the structural loading on the embankment, then additional water storage can be achieved here relatively inexpensively.

destruction or damage, and to the capability to restore areas after natural hazard has occurred. This project seeks to improve the resilience of the affected communes to scarcity of water due climate change and longer periods of drought through the provision of:

- Increased storage capacity of fresh water

Location

Kep province Angkaol Commune

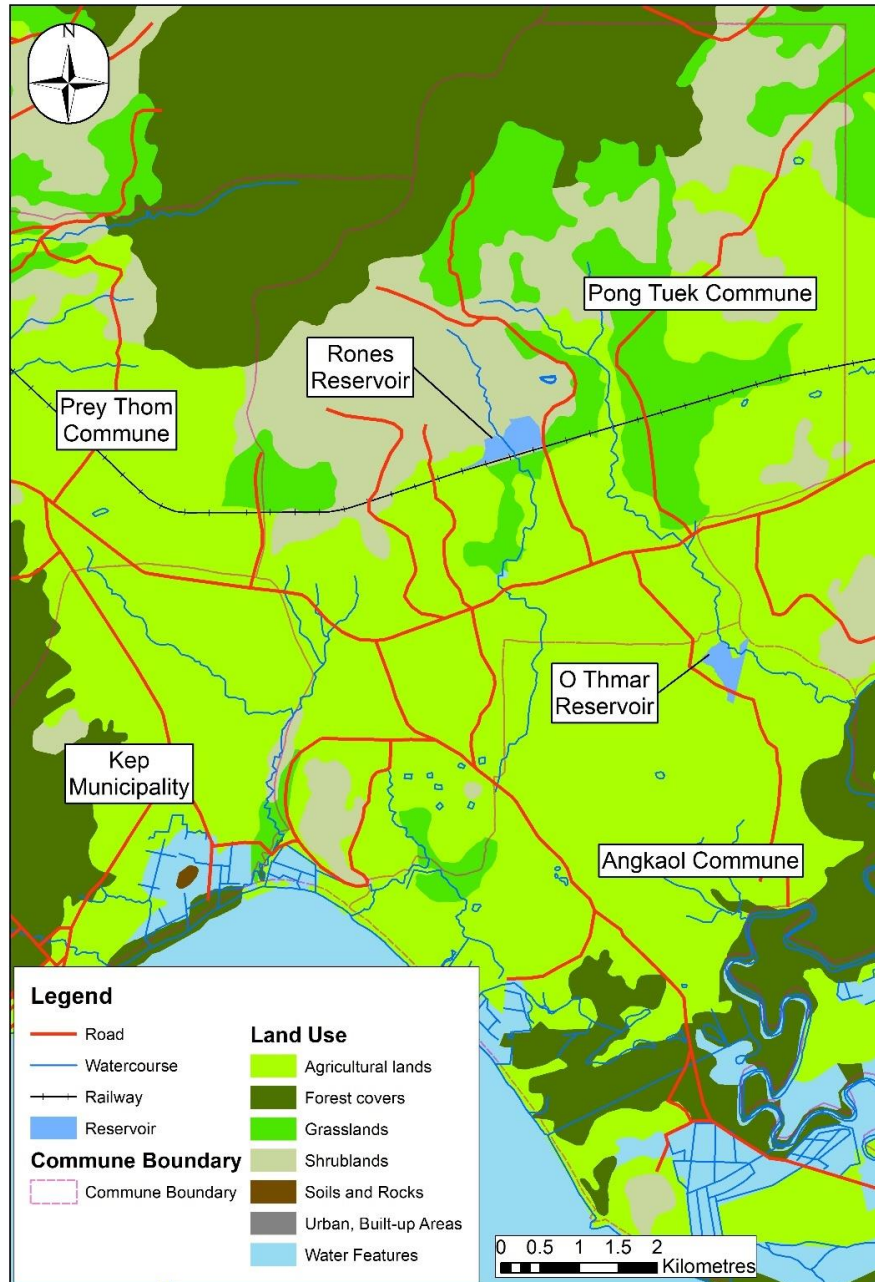


Figure 1 “Map 1 O Thmar and Rones Reservoirs”



**Figure 2** “Map 2 O Thmar Reservoir location”

## Beneficiaries

O Thmar reservoir provides irrigation and drinking water supply for large parts of Angkaol Commune and part of Pong Teuk commune and can also provide water to people from other local communes (including in neighbouring Kampot Province, which is less than 1 km to the east of O Thmar) who drive to site and collect it. There are in the region of 14,060 people for whom O Thmar is the principal or preferred source of water. By improving storage in the reservoir, the probability of downstream areas being affected by flooding is also reduced, and this further benefits the 8,566 residents of Angkaol commune.

**Table 1**

### Key statistics - O Thmar Reservoir

DESCRIPTION	QUANTITY
Surface area (m2) *	216,000
Maximum retained water depth at dam (m)	3
Assumed existing storage volume (m3)	250,000
Volume of potential storage taken up by islands and shallows within reservoir (m3) *	108,000
Total potential storage following excavation work (existing + additional) (m3)	358,000

\* The surface area is estimated from Google Earth satellite imagery. The volume of storage taken up by islands and shallows is estimated from Google Earth satellite imagery (taken during the dry season with low water levels) and assumed average depth.

A rice paddy field needs typically 1200-1400 mm per crop (according to the CCCA Report, 2014). This is supported by other studies, (e.g. CAB International 2003), which indicates 1500 mm per crop for sandy loamy soils.

Based on the rainfall data from the Kampot Province in the period between 1981-2004 the lowest annual precipitation is 1320 mm/year (CCCA Report 2014) allowing the farmers to typically harvest just once a year, during the wet season.

- The estimated demand on rice paddy 1200-1400 mm per 1 m2, so a volume of 1.2 – 1.4 m3.
- The estimated additional storage capacity by excavating within O Thmar is 108,000 m3.
- Therefore, the additional capacity within O Thmar would be sufficient for providing irrigation for a second crop for 8 - 9 hectares of rice field, or even more land for vegetable cultivation (which has a lower water demand).
- 9 ha represent 1.5% of the 600 ha downstream area served by O Thmar reservoir which would be enabled to grow a second crop.

This will have a significant benefit considering the observed trend for longer dry seasons and less annual rainfall as predicted for the area.

**Table 2**

*Irrigation demand and supply by O Thmar Reservoir*

Description	Quantity
Demand annually	1200 – 1400 mm/year
Dry year 1981-2004	1320 mm/year
Additional storage capacity O Thmar	108,000 m <sup>3</sup>
Additional area irrigated by O Thmar	9 ha (= 108,000 m <sup>2</sup> / 1200 mm)

**Table 3**

*Annual rainfall at three locations for 1981-2004 (CCCA report 2014)*



Table 2: Estimated annual rainfall at 3 locations

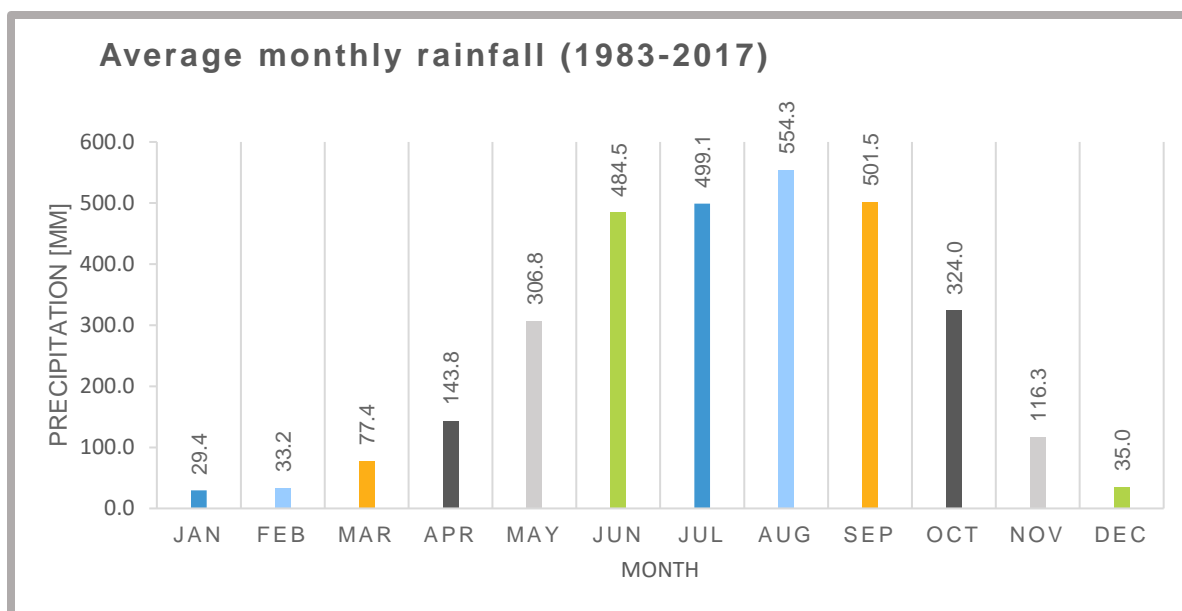
	Sihanoukville	Koh Kong	Kampot
Highest in 16 years	4,230 mm/year	3,970 mm/year	2,450 mm/year
Average over 16 years	3,240 mm/year	3,030 mm/year	1,870 mm/year
Lowest in 16 years	2,290 mm/year	2,150 mm/year	1,320 mm/year
Available every 2nd year	3,330 mm/year	3,130 mm/year	1,930 mm/year
Available 4 out of 5 years	2,940 mm/year	2,750 mm/year	1,700 mm/year
Available 9 out of 10 years	2,560 mm/year	2,400 mm/year	1,480 mm/year

Note: The rainfall varies significantly within each province, as illustrated on the map on the previous page

Table 2: Estimated annual rainfall at 3 locations

	Sihanoukville	Koh Kong	Kampot
Highest in 16 years	4,230 mm/year	3,970 mm/year	2,450 mm/year
Average over 16 years	3,240 mm/year	3,030 mm/year	1,870 mm/year
Lowest in 16 years	2,290 mm/year	2,150 mm/year	1,320 mm/year
Available every 2nd year	3,330 mm/year	3,130 mm/year	1,930 mm/year
Available 4 out of 5 years	2,940 mm/year	2,750 mm/year	1,700 mm/year
Available 9 out of 10 years	2,560 mm/year	2,400 mm/year	1,480 mm/year

Note: The rainfall varies significantly within each province, as illustrated on the map on the previous page



**Figure 3** “Mean monthly precipitation 1983-2017 Sihanoukville (Department of Water Resources and Meteorology)”

## BUDGET

### *Inspection and Excavation cost O Thmar Reservoir*

The budget is roughly determined by the cost for excavation and estimated amounts of material to be removed.

Description	Quantity	Unit Price	Cost
Vegetation management (trimming trees, removing scrub) on embankment	60 trees	\$ 9	\$ 540
Detailed inspection of the dam by a qualified dams engineer (same visit as for Roness)	5 days	\$ 500	\$ 2,500

Dams safety investigation, including hydrological, hydraulic engineering and geotechnical studies, to verify dam for additional water storage	40 days	\$ 300	\$ 12,000
Ground investigation – analysis of samples of material excavated from islands to determine suitability for re-use in local construction projects			\$ 7,500
Excavation cost per cubic metre	108,000	\$ 5	\$ 540,000
Transport (included in excavation cost)		-	\$ 0
Excavation equipment	2,000	\$ 39	\$ 78,000
Labour (skilled)	250	\$ 30	\$ 7,500
Labour (unskilled)	800	\$ 15	\$ 12,000
		<b>TOTAL</b>	<b>\$ 660,040</b>

If material is excavated dry, and proved suitable from geotechnical testing, it can be re-used in construction works. The intention is to re-use as much excavated material as possible in local construction works such as the new sea flooding embankment at Angkaol, or embankment widening works at Roness following the redesign of the dam there (see sheet 3.4b). If it is not suitable for that use, other local beneficial uses should be found where possible. This could include the reclamation of abandoned salt farm workings. Material removed wet by dredging the bed of the reservoir (once tested for any contaminants) could be re-used as soil dressing, restoring nutrients to local soils. The costing includes transport and disposal within the Kep Province area or in neighbouring parts of Kampot.

## DATA COLLECTION

### *Inputs*

The following input is used as data source for benefit calculations and water demands for rice cropping:

Climate-resilient irrigation guidance paper, 2014. Coastal Adaptation and Resilience Planning Component, Cambodia Climate Change Alliance (CCCA)

Water Productivity in Agriculture: Limits and Opportunities for Improvement (eds J.W. Kijne, R. Barker and D. Molden), CAB International 2003.

Report on Shoreline Assessment on Climate Change, Cambodia Ministry of Environment

The Kep Provincial Department of Water Resources and Meteorology advised that they have 10 water storage reservoirs, 9 of which are in Pong Teuk commune. Two of these, Roness and O Thmar, are considered a priority for attention. They consider Roness reservoir as the top priority for rehabilitation, followed by O Thmar. There is a connection between the two, with Roness further upstream. There is also a separate natural inflow to O Thmar which flows directly from high ground to the east of Roness.

## *Consultations*

The following governmental organisations were consulted:

17-10-2018 – Kep province Department of Water Resources and Meteorology

18-10-2018 – Angkaol Commune

19-10-2018 – Pong Teuk Commune

O Thmar reservoir appears to be in good condition with the embankment, spillway and the water gates serviceable and the reservoir currently holding full volumes. Some minor embankment repairs and vegetation management on the downstream side should be undertaken but the reservoir is generally in much better condition than Rones. O Thmar reservoir can relatively easily benefit more livelihoods by increasing the storage capacity while maintaining the same dam height. In combination with the two other investments on canal rehabilitation and water gate repair the excavation of high ground within O Thmar leads to significant improvements in local water resilience, being more able to store fresh water that is becoming more scarce due to climate change.

Based on community consultations the area irrigated by the O Thmar reservoir is estimated as 600 hectares. Figure 5 supports the information given by the Commune on the irrigated area.

## ***Site Records***

O Thmar dam is a 4m earth embankment impounding an area of water of up to 3m depth at the dam, with manual sluice gates (Figure 1) to allow downstream discharge into irrigation canals. The 1.2 km length embankment at O Thmar is a maximum of 4m above adjacent downstream ground level, with an approx. 4m wide crest, 1 in 3 side slopes maintained in good condition with limited vegetation (figure 2), a series of manual sluice water gates for controlling downstream flow into irrigation channels and an automatic radial gate to function as an overflow into the spillway (figure 4). One manual underpass is installed for flushing sediments. The dam condition appears reasonable but there is a small amount of vegetation on the downslope side (see Figure 2) which should be managed to facilitate inspection.

The upstream catchment is approx. 1,980 ha and the area downstream which would potentially be inundated by a breach 1,415 ha across largely rural and more sparsely populated countryside. There is no major concentration of infrastructure downstream of O Thmar, but up to 8,000 people live in low-lying, dispersed farming communities downstream. There is some erosion around the wing walls on the downslope side of the embankment adjacent to the sluice gates. It was observed that much of the area within O Thmar reservoir comprises islands clear of the water surface and there is much vegetation on the water surface within the impounded area, which extends to approximately 21 hectares. It was apparent that, as the dam is in apparently good condition, there is the potential for the islands in this reservoir to be removed in order to improve storage capacity without changing the structure of the dam itself. The underlying geology at the dam is described as 'Quaternary Pediments', which indicates alluvial sedimentary material which can be relatively easy to excavate.

Satellite imagery shows that approximately 50% of the area is silted and overgrown with vegetation such as water lilies, although this could be misleading if the photographs were taken during the dry season. The retained water depth is approximately 3 m at the dam and can be expected to be less further

upstream. For the purposes of this investment we have estimated that 108,000 m<sup>3</sup> of material could be removed.

## IMPLEMENTATION

### *Design*

Although the dam appears to be in good condition, comparison with other local dams and the knowledge that they were all built during the Khmer Rouge regime (1975-9) when modern engineering standards were unlikely to be adhered to raises concern over the long-term safety of the structure. Therefore we propose to carry out an inspection by a qualified dams engineer and a hydrological / hydraulic engineering and geotechnical investigation of the dam. While the proposed works do not increase the loading on the dam, they will result in larger volumes of water being stored and so potentially greater risk in the event of a failure, hence the need to undertake the detailed inspection.

The inspection can be done in conjunction with the proposal for facilitating refurbishment of the Rones dam. A qualified dams engineer should visit and carry out a detailed inspection of the dam, spillway, sluices and any other structures. This would be followed by a detailed investigation study, scoped as necessary under the instruction of the dams engineer following the inspection. This study will identify any remedial work needed to ensure the continued safe operation of the dam and reservoir.

### *Geotechnical Investigation – Islands*

It is intended to beneficially re-use as much material excavated from the reservoir as possible. Some of the material may be suitable for use in the proposed sea flood defence embankment at Angkaol (see other investment sheet for details), 3 km to the south of O Thmar. In order to determine suitability a geotechnical investigation is proposed for the areas to be excavated. This amounts to laboratory testing of samples taken from the excavated material and analysed as follows:

Laboratory testing (it is assumed no rock material will be encountered).

#### Non-cohesive soils

The following tests are required on non-cohesive soil samples:

- Particle size analysis (classes/sieve dimensions);
- Hydrometer tests on selected samples;
- Triaxial tests (consolidated drained, minimum/maximum density).

#### Cohesive soils

The following tests are required on cohesive soil samples:

- Atterberg limits;
- Moisture content;
- In situ density (by undisturbed samples);

- Un-drained shear strength (pocket penetrometer and/or torvane in field);
- Triaxial tests (consolidated undrained);
- Particle size analysis (classes/sieve dimensions);
- Hydrometer tests on selected samples;
- Consolidation test.

### *Community Engagement*

The local community have been proactive in requesting improvements to the local water supply and are expected to be fully supportive of the project. The contractor must ensure that any disruption to the local community during the works is minimised and, where possible, local labour is employed.

### *Construction*

It is recommended that the excavation work is carried out in the second half of the dry season. This will mean retained water levels are lower, allowing access for machinery to reach parts of the reservoir bed and the island areas safely in the dry. It will also mean that material can be excavated dry and will not then need to be drained before being removed from site (if material is removed wet it is heavier and would require more transport and incur greater cost), and it will minimise the mobilization of wet silt within the reservoir. It is proposed to re-use as much of this material as possible, where it is suitable, in local construction projects and this would not be possible if the material is removed wet, as then it would lack structural cohesion. However, any accumulated silt at the bottom of the O Thmar reservoir can also be removed using conventional dredging methods, by excavator from a pontoon and disposed of (possibly by spreading on fields) to further enhance the storage capacity. The works will probably need to proceed over two consecutive years as removal of 108,000 m<sup>3</sup> of material will require 13,500 HGV movements (assuming 8 m<sup>3</sup> vehicle capacity).

To allow machinery access into the reservoir to enable excavation, a temporary road access from the upstream side of the reservoir into the area where the islands are is required. **Machinery should NOT access the reservoir bed from the dam, as this would damage the dam structure.**

It is essential to the stability of the dam that the excavation does not take place within close proximity of the upstream toe of the embankment, the proximity to be determined by the qualified dams engineer during the inspection. However, subject to instruction by a qualified dams engineer, any vegetation rooted in this area and on the upstream face of the dam should be managed to prevent obstruction of the spillway or damage to the dam. Nowhere in the reservoir should the bed be lowered to a depth below the cill of the outflow sluice gates, as any deeper water could not then be distributed.

During the excavation works and into the following rainy season a daily inspection of upstream and downstream slopes along the entire length of O Thmar dam must be carried out to observe any changes in the dam. Dams are at their most vulnerable during construction or modification, and although there is no intention to change the dam configuration in any way, the excavation work will result in changes in both storage capacity and flow paths within the reservoir, and this has the potential to affect the dam.

### *Contractor Requirements*

The maintenance work on the reservoir requires a specialist contractor who is familiar with the risks involved. The following precautions should be considered while selecting a contractor.

- Compliance with international health and safety standards
- Experience with construction, maintenance and dredging reservoirs or similar infrastructure
- Trained staff, especially working near and on waterbodies.
- Before executing the maintenance work a check on Unexploded Ordnance (UXOs) is mandatory
- Access routes for excavation machinery to reach the reservoir bed should be from the upstream (shallow) side of the reservoir and not off the dam itself.

Further information about the Environmental and Social safeguard provisions of the project can be found in [Part II, Section K](#), and [Annex 3](#) to the proposal.

### ***Key Risks & Safeguarding Issues***

Table 3 is accounting for all the Environmental and social safeguarding issues involved in the O Thmar reservoir rehabilitation. Labour rights and safety are of particular interest by restoring the reservoir. Choosing a contractor with the right requirements in this project is essential for risk mitigation on the social safeguards. Furthermore, the educational part on water use and reservoir maintenance provides for a more efficient use of natural resource, by limiting the wasting of fresh water resources.

# PHOTOS





*Figure 4 “underpass O Thmar sluice”*

**Figure 5** *“O Thmar Embankment”*



**Figure 6** *“Vegetation on the surface of O Thmar Reservoir and upstream face of the dam, adjacent to the spillway”*



**Figure 7** *“O Thmar reservoir automatic radial gate and spillway”*



**Figure 8** *“irrigated rice paddy fields Kep province (Kep Province Department of Meteorology and Water Resources)”*



**Table 1**

*Environmental and Social Safeguard and risk mitigations incorporated*

<b>Environmental and Social Safeguard Principle</b>	<b>Risk Mitigation Actions Incorporated in The Design</b>
<p><b><i>Compliance with the law</i></b>            projects/programmes supported by the Fund shall be in compliance with all applicable domestic and international law.</p>	<p>The waterbodies are public land.</p>
<p><b><i>Access and Equity</i></b>            Projects/programmes supported by the Fund shall provide fair and equitable access to benefits in a manner that is inclusive and does not impede access to basic health services, clean water and sanitation, energy, education, housing, safe and decent working conditions, and land rights. Projects/programmes should not exacerbate existing inequities, particularly with respect to marginalized or vulnerable groups.</p>	<p>Currently there are no signs of unequal sharing in the water supply. Of course the effort of people further away from the source is bigger than those close by, the measures proposed will not change the accessibility and the equitability of the source. The measures only enlarge the availability of fresh water to all beneficiaries.</p>
<p><b><i>Marginalised and Vulnerable Groups</i></b>            Projects/programmes supported by the Fund shall avoid imposing any disproportionate adverse impacts on marginalized and vulnerable groups including children, women and girls, the elderly, indigenous people, tribal groups, displaced people, refugees, people living with disabilities, and people living with HIV/AIDS. In screening any proposed project/programme, the implementing entities shall assess and consider particular impacts on marginalized and vulnerable groups.</p>	<p>The improvements on the water system will not marginalise vulnerable groups.</p>
<p><b><i>Human Rights</i></b>            Projects/programmes supported by the Fund shall respect and where applicable promote international human rights.</p>	<p>There are no anticipated issues regarding human rights.</p>

**Gender Equity and Women's Empowerment**  
Projects/programmes supported by the Fund shall be designed and implemented in such a way that both women and men 1) have equal opportunities to participate as per the Fund gender policy; 2) receive comparable social and economic benefits; and 3) do not suffer disproportionate adverse effects during the development process.

In the poor communities affected by the proposal it was observed that women tend to take more of a household and community management role and therefore they are likely to benefit further from the community's improved crop yield, as they will be likely to take on the role of selling surplus crops. The men will benefit from improved yields from their labours.

**Core Labour Rights**

Projects/programmes supported by the Fund shall meet the core labour standards as identified by the International Labour Organization.

Maintenance work needs to be done according to the standards. The contractor required to the job needs to fulfil these requirements.

**Indigenous People**

The Fund shall not support projects/programmes that are inconsistent with the rights and responsibilities set forth in the UN Declaration on the Rights of Indigenous Peoples and other applicable international instruments relating to indigenous peoples.

The water reservoir enhancement will not harm the life of indigenous people. There is no evidence of indigenous people in the target area

**Involuntary Resettlement**

Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids or minimizes the need for involuntary resettlement. When limited involuntary resettlement is unavoidable, due process should be observed so that displaced persons shall be informed of their rights, consulted on their options, and offered technically, economically, and socially feasible resettlement alternatives or fair and adequate compensation.

The works all involve work on public state owned land. Therefore, no involuntary resettlement is required.

***Protection of Natural Habitat***

The Fund shall not support projects/programmes that would involve unjustified conversion or degradation of critical natural habitats, including those that are (a) legally protected; (b) officially proposed for protection; (c) recognized by authoritative sources for their high conservation value, including as critical habitat; or (d) recognized as protected by traditional or indigenous local communities.

The water reservoir is not appointed as natural habitat protection area.

***Conservation of Biological Diversity***

Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids any significant or unjustified reduction or loss of biological diversity or the introduction of known invasive species.

The waterbody in its current state is home to vegetation and water plants, but has no official status as natural habitat. O Thmar is not a natural lake This is not a protected area, however, any dredging will lower the biological diversity temporarily.

***Climate Change***

Projects/programmes supported by the Fund shall not result in any significant or unjustified increase in greenhouse gas emissions or other drivers of climate change.

The enhancement will increase the resilience of the population to climate change. While the excavation operation will involve some machinery, the long term operation of the reservoir and associated infrastructure will not emit GHGs that cause climate change.

***Pollution Prevention and Resource Efficiency***

Projects/programmes supported by the Fund shall be designed and implemented in a way that meets applicable international standards for maximizing energy efficiency and minimizing material resource use, the production of wastes, and the release of pollutants.

Undertaking the excavation work when water levels are low will minimise the risk of mobilising sediment into the water supply. As much excavated material as possible, where suitable, should be re-used on local construction projects such as the new sea flood defence embankment at Angkaol. Alternatively, with agreement of the landowners it could be deposited in some of the abandoned salt farm workings in Angkaol Commune to raise the ground level for agriculture. There may be a need to dispose of some silty material that cannot be beneficially re-used.



**Public Health**

Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids potentially significant negative impacts on public health.

The storage of fresh water increases the access to fresh water.

**Physical and Cultural Heritage**

Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids the alteration, damage, or removal of any physical cultural resources, cultural sites, and sites with unique natural values recognized as such at the community, national or international level. Projects/programmes should also not permanently interfere with existing access and use of such physical and cultural resources.

There is no cultural heritage at stake.

**Land and Soil Conservation**

Projects/programmes supported by the Fund shall be designed and implemented in a way that promotes soil conservation and avoids degradation or conversion of productive lands or land that provides valuable ecosystem services.

The reservoir enhancement provides means to the local community to conserve more fertile and productive land. With a larger amount of fresh water availability, a larger stretch of agricultural land can be used or productivity on current plots can be enlarged.



# Output 3.4b FACILITATING THE REFURBISHMENT OF RONESS RESERVOIR

Investment ID: 3.4b

## INTRODUCTION



Deliverables	<ul style="list-style-type: none"><li>• Remove vegetation</li><li>• Ground investigation and engineer’s inspection to inform refurbishment design</li><li>• Full redesign of dam</li><li>• Construction of fully refurbished dam to engineer’s design</li></ul>
Beneficiaries	24,470
Budget	US\$ 1,304,000
Location	Protects Kep, Angkaol and Pong Teuk Communes

### ***Problem statement***

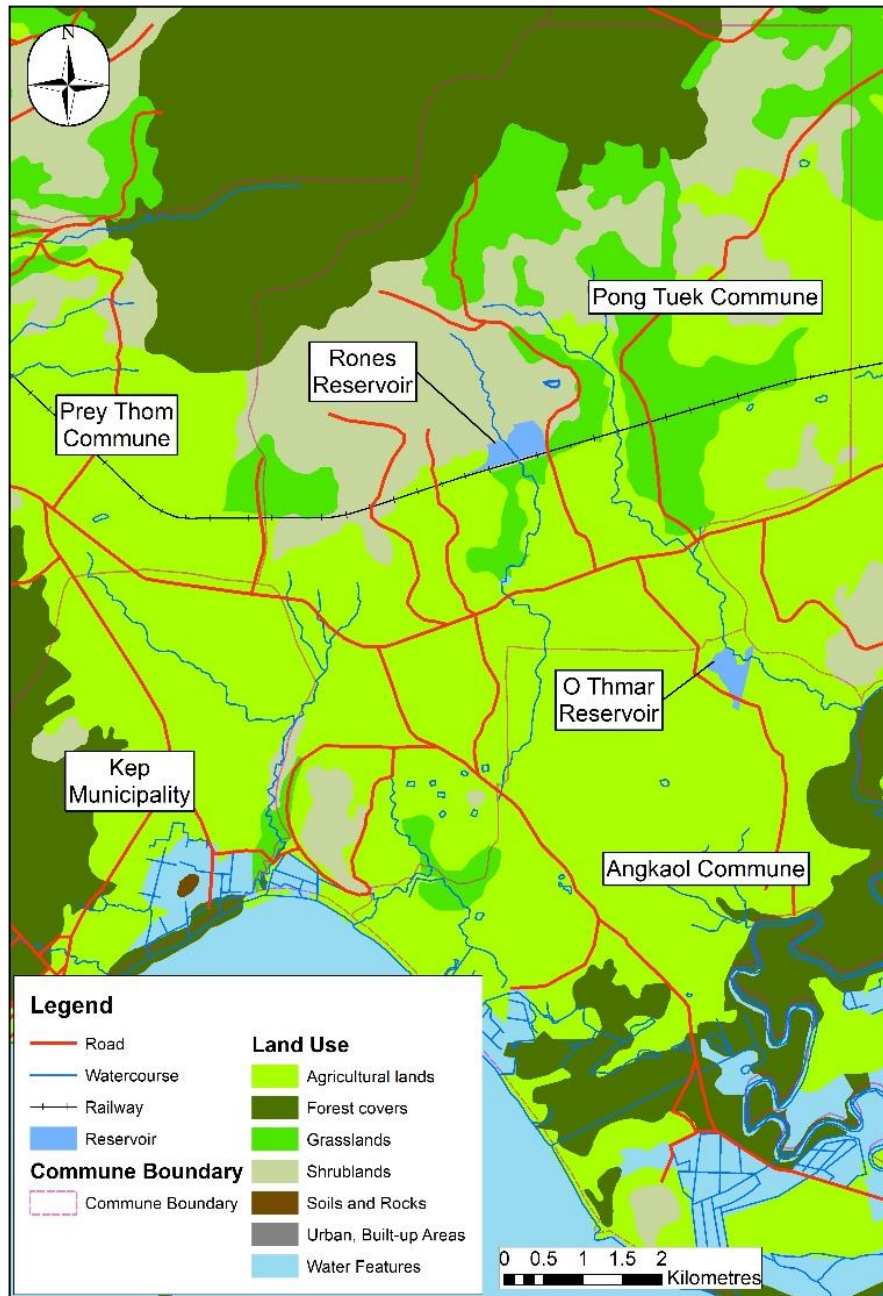
Of the ten reservoirs in Kep Province Roness is one of the highest and largest. As such, it is easier for downstream communities to obtain water from Roness and the area reliant on the reservoir for water is approximately 22 km<sup>2</sup>. It can also provide additional water supply to downstream reservoirs such as O Thmar through connecting channels in the low-lying agricultural area of Pong Teuk commune. Unfortunately, the dam is dilapidated and, as it was constructed during the Khmer Rouge regime (1975-1979) it was not built to modern engineering standards. Therefore, the reservoir is currently maintained with a very low water level and impounds at most 1m depth of water rather than the theoretical maximum 3.5m. If it is possible to refurbish the reservoir to retain closer to the original intended capacity this would provide much greater water security for the entire province and improve crop yields during the dry season.

This investment provides sufficient budget for a complete investigation, detailed design and refurbishment of the dam, based on the information gathered across three extensive consultations and field visits. The construction costs presented are based on these consultations and site visits. The detailed inspection and design may uncover the need for further works as a 'phase 2' beyond the life of the present project. These will not, however, compromise the effectiveness or safety of the works proposed here, but will propose further enhancements to the dam in the future.

Given that the western area of the Roness dam impounds a small body of water relative to the length of dam wall there may be opportunities during the detail design phase to realign the dam wall to reduce construction costs with minimal impacts to water storage capacity.

### ***Location***

The existing Roness Dam is located approximately in the centre of Pong Teuk Commune, immediately upstream of the Phnom Penh to Sihanoukville railway line. The location is shown on the map below.



**Figure 1** Map 1 – Location of Rones Reservoir

## Beneficiaries

Roness reservoir provides a water supply for Pong Teuk and Angkaol Communes and Kep Province. The collective population of these three settlements is 24,470. While Roness is not the only supply reservoir for these communes the availability of additional water supply through the dry season would certainly be of benefit to the entire neighbourhood as it would provide additional water security and improve the prospects for double or even triple cropping. It would also improve the prospects for increased local tourism, both through improved water supply and through the potential for recreational activity such as boating, watersports and freshwater fishing.

A complication does exist at Roness as, since the impounded water has been maintained at its current low level due to the state of the embankment, some local villagers have begun to cultivate areas within the footprint of the reservoir. If the embankment is upgraded and the reservoir restored to hold more water than at present this will cause detriment to those people farming within the reservoir extent. However, there is the potential for these people to adapt to alternative livelihoods supporting the additional economic activities that a restored reservoir could attract (e.g. farming goats to graze the embankment to keep it clear of large vegetation; freshwater fishing; providing boating for visitors). There would not be any requirement for resettlement as the local villagers live in a small community just to the east of the reservoir, outside the embankment. The full refurbishment of the reservoir would improve safety for the community by reducing the risk of dam failure.

## BUDGET

### *Investigation, development of design and estimate of construction for Dam Embankment*

Description	Quantity	Unit Price	Cost
Vegetation clearance / management on embankment (1.4 km x 5m)	7,000 m <sup>2</sup>	\$ 9	\$ 63,000
Ground Investigation (20 boreholes to 15m depth, 5 boreholes to 25m depth, 30 boreholes to 10m depth and conversion of 8 boreholes to monitoring wells to 10m depth), including field engineer supervision	725m	\$ 120	\$ 87,000
Ground investigation – testing and analysis of samples (as detailed in implementation section below)			\$ 45,000
Monitoring wells – recording of data on a weekly basis (done by existing reservoir maintenance staff on site)			\$ 0
International consultancy support / supervision	160 individual work hours	\$ 250	\$ 40,000

Dams Supervising Engineer – supervision and review of inspection, design (assume 4 weeks)	100 individual work days	\$ 500	\$ 50,000
Design support team – hydrology, hydraulic engineer, geologist, structural engineer (average unit rate, national engineer)	600 individual work days	\$ 300	\$ 180,000
QA	4 individual work days	\$ 300	\$ 1,200
Additional material required to widen and improve safety of the dam (estimated – based on additional average dam cross-section of 35m <sup>2</sup> over 1.4km length)	50,000 m <sup>3</sup>	\$ 8	\$ 400,000
Polythene liner embedded in dam upstream face and keyed into bed of reservoir (1.4 km x 18m)	25,200 m <sup>2</sup>	\$ 4	\$ 100,800
Additional concrete works (spillway, apron, gate housings)	250 m <sup>3</sup>	\$ 145	\$ 36,250
Spillway surface reinforcement			\$ 150,000
Labour (skilled) (15 skilled operatives for 5 months)	2,500 individual work days	\$ 30	\$ 75,000
Labour (unskilled) (workforce of 50 working 8 hour days for 5 months)	5,050 individual work days	\$ 15	\$ 75,750
		<b>TOTAL</b>	<b>\$1,304,000</b>

## DATA COLLECTION

### *Inputs*

This study has been informed by data provided by the Ministry of the Environment, Kep Provincial Department of Water Resources and Meteorology, Kep Provincial Department of the Environment and Pong Teuk Commune. Costings data has been provided by Arcadis and by the UN Habitat Programme Manager for Cambodia. Mapping has used Google Earth satellite imagery and openly available GIS data including geology, land use and watercourses. Advice on the necessary site investigations and hydrological / hydraulic studies has been provided by dams and geotechnical specialists within Arcadis and a site visit has informed the understanding of the dam condition and situation.

### *Consultations*

Consultation has been carried out with the Ministry of the Environment, Kep Provincial Department of Meteorology and Water Resources, Kep Provincial Department of the Environment and Pong Teuk Commune.

## *Site Records*

The site visits to Rones Reservoir included a site visit to the main south-facing dam that runs parallel to and 30m north of the railway line. The embankment has approximately 1:1 side slopes of a fairly sandy material although seemingly containing cohesive material and well-compacted. The downslope side is mostly heavily vegetated with a number of large holes where root boles have been pulled out with fallen trees (Figure 1). There are sporadic trees on the upstream face of the dam as well, and during the visit a branch fell from one of these trees into the water (Figure 3). A small mechanical excavator was present for undertaking some limited vegetation clearance from and repairs to the dam crest, but the angle of slope limited the ability to clear a lot of the vegetation. There was no spillway. We observed two manual sluice water gates (one had a damaged spindle but appeared to be still operable) and noted that there is a maintenance engineer retained on site to operate these in the event of a flood to prevent water building up behind the dam. The crest was approximately 4m wide, which enabled vehicle access along the top. According to GIS data and Google Maps the crest along the east-facing section of the embankment forms a public road, although like many rural roads here this is unsurfaced. Outflow channels to the south passed under the railway line in culverts (Figure 5) and then ran through the adjacent agricultural land serving irrigation channels. The culverts under the railway did not appear adequate to accommodate a significant outflow from the reservoir if all the sluice gates were fully opened in a flood event. We were advised that the railway had only recently been renovated and the track appeared in a very good condition. Water marks on the concrete of the sluice gate housings showed the level water had formerly been maintained at, which is approx. 3.5m from assumed bed level (assuming the bed of the reservoir is at the same level as ground on the downstream side of the embankment). On the same assumption current water level was maintained at no more than 1m from bed. There were observed to be established woodlands within the footprint of the reservoir and appeared also to be some cultivated areas, which are more apparent from Google Earth satellite imagery dated 07/02/2018. We observed several people within the wooded areas.

## IMPLEMENTATION

### *Design*

To safely and effectively complete the refurbishment of the dam at Rones Reservoir, a full investigation and redesign of the dam to include a spillway and other modern safety features which are not currently present is required.

While the consultations and site visits conducted initial investigations and allowed for a concept design to be developed. The detailed site investigation inclusive of geotechnical testing and the detailed design of the dam are to occur in the next phase of works - cost and time implications precluded these works from taking place prior to the submission of the proposal. Any additional construction activities identified during the detailed design phase will be put forward in a proposal for phase 2 works to be implemented in the future to guarantee enhanced functionality in the context of reducing rainfall and a growing population.



An assessment of the Roness dam western wall alignment is to be investigated during the detailed design phase. As the western wall impounds a small body of water relative to its length there are opportunities to reduce construction costs with minimal impacts to overall water storage capacity.

#### *Vegetation Clearance*

Firstly, the extent of vegetation along the embankment is both a source of weakness (there is a risk of piping along tree roots, and the root boles of fallen trees cause large-scale physical damage to the embankment) and inhibits the ability to inspect the dam for leaks and other damage. The dam should be inspected by a qualified dams engineer who can instruct on the removal or management of vegetation to minimise disruption to the embankment (felling of established trees may cause more problems with leakage pathways as the roots rot). Any damage from trees that have already fallen, or where tree boles need to be removed, should be repaired before proceeding to the second stage of work. Subject to instructions by the qualified dams engineer, the ground surface on the downstream slope should then be maintained as far as possible as simply grass cover – to enable this it is recommended the area is fenced in and grazed by goats (cattle would be too heavy and could over-graze and damage the slope).

#### *Geotechnical Investigation*

The second element of work will be to undertake geotechnical investigation to establish the quality of the material the dam is built from and the material it is built on. It is not believed that there are any design drawings or specifications dating from the dam construction, and so it is proposed that a series of boreholes are advanced along the dam crest, the upstream and downstream toes, and at the locations of the proposed outlet works and spillway(s) to sample and test existing embankment and foundation soils. If, during the drilling of the boreholes, it is apparent that the material in or under the dam changes between two boreholes, additional ones should be drilled between the two that show differences to determine where an underlying change occurs.

The purpose of the geotechnical investigation is to determine the quality of the soil in the dam and the sub-soil conditions including ground water levels. The Length of the dam is approximately 1400 m.

#### *Site investigation:*

- Approximately 25 borings along the dam crest spaced approximately every 70 m including continuous Standard Penetration Tests (SPTs), and (un)disturbed sampling. Five borings would be advanced to top of rock or a maximum depth of 25 m. The remaining 20 would be advanced to a depth of approximately 15 m from the crest of the dam (up to at least 10 m into the original sub-soil).
- Approximately 30 borings along the dam's upstream and downstream toes and at the location of the spillway(s) and outlet works advanced to an average depth of 10 m into natural ground
- Convert 8 borings along 4 cross-sections, spaced at approximately 500m into monitoring wells (approximately 10 m deep) to determine the piezometric level.

At the discretion of the qualified dams engineer, some borings could be replaced by Cone Penetration Testing (CPT's). It is assumed that drilling through the dam material and sub-soil can be executed by

percussion boring or an equal system. In case hard soil (rock) is encountered then drilling using the rotary coring technique will be necessary.

Laboratory testing (it is assumed no rock material will be encountered) to be conducted on existing embankment soils and foundation soils.

#### *Non-cohesive soils*

The following tests are required on non-cohesive soil samples:

- Particle size analysis (classes/sieve dimensions);
- Hydrometer tests on selected samples;
- Triaxial tests (consolidated drained, minimum/maximum density).

#### *Cohesive soils*

The following tests are required on cohesive soil samples:

- Atterberg limits;
- Moisture content;
- In situ density (by undisturbed samples);
- Un-drained shear strength (pocket penetrometer and/or torvane in field);
- Triaxial tests (consolidated undrained with pore pressure measurements);
- Particle size analysis (classes/sieve dimensions);
- Hydrometer tests on selected samples;
- Consolidation test.
- Dispersion tests

For the Roness dam this will to the following amount of site investigation and laboratory testing:

- 20 borings including SPT's and (un)disturbed sampling up to depth of 15 m;
- 5 borings including SPT's and (un)disturbed sampling up to depth of 25 m;
- 30 borings to a depth of 10 m
- 8 monitoring wells including monitoring every week (to be done by existing on-site maintenance operatives following training);
- Continuous SPTs
- 15 determination of undrained shear strength (pocket penetrometer and/or torvane in field).
- 15 disturbed samples (short borings)
- 30 disturbed samples (long borings: dam material and sub-soil)
- 15 undisturbed samples (sub soil)

Approximate amount of tests (non-cohesive

- 20 Particle size analysis (5 including hydrometer tests);
- 10 Triaxial tests of 9 samples each (each with 3 confining pressures) for all soils – existing embankment and foundation soils

Approximate amount of tests (cohesive):

- 25 Atterberg limits;
- 15 organic content;
- 250 water content;
- 10 particle size analysis incl. hydrometer tests;
- 15 in-situ density;
- 5 triaxial tests of 9 samples each (each with 3 confining pressures) for all soils – existing embankment, foundation soils;
- 5 consolidation tests.

#### *Detailed Inspection and Design Report*

Third, the qualified dams engineer should carry out a thorough inspection of the dam and the reservoir. Then, with support from specialist hydrological and hydraulic engineers, and including analysis of the geotechnical investigation, the dams engineer should produce a report detailing the works required to bring the dam up to modern safety standards. This report should include:

- A study of the local geological and hydrological conditions;
- A site visit;
- Determine and collect basic assumptions for the design of the dam, e.g. earthquake loads, spillway requirements and ancillary objects etc.;
- Planning, execution and supervision of the site investigation specified above;
- Design of the dam: determination of dam height or maximum water level, dam dimensions, spillway, channel design incl. revetments, design culverts including foundation of these objects;
- Design drawings and contract, bill of quantities etc.
- This report will involve input from specialist teams in the following areas:
- Hydrologic & hydraulic analysis and hydraulic design of outlet works and spillway(s)
- Geotechnical analysis and design for embankment design, seepage controls, foundation treatment
- Structural design of outlet works and spillway(s)
- Civil design and preparation of drawings and technical specifications

The following assumptions have been made in determining the extent of work on the Roness Dam.

- 1) Numbers and depths of borings are estimates required to facilitate design of a fully refurbished embankment. If the intent of this document is to only provide the program and cost for a preliminary geotechnical investigation, then the program can be cut back. See comments in the text.
- 2) Dam foundation consists of alluvial sediments with unknown depth to rock (but assumed at no more than 25 m).
- 3) Dam is 1400 m long and up to 4 m high
- 4) Outlet work to be designed consists of tower and conduit
- 5) Spillway(s) to be designed consist of open channel structure(s) on one of the abutments.
- 6) Assumptions for foundation conditions:

- a. Rock is deep and will not factor into the foundation analysis or require special evaluation or treatment.
- b. There will be suitable low-permeability soil stratum within 10-12 m of the natural ground surface.
- 7) Terrain is relatively flat.
- 8) There are no property or other restrictions for locating spillway(s) and outlet works.
- 9) Assumes no time for environmental assessments or permitting
- 10) Does not include any bidding or procurement assistance or construction phase services.
- 11) Assumes 8 to 12-month design period following the geotechnical investigation.

The above reconstruction procedure at this stage assumes:

- 1) Suitability of the existing material from the dam for the refurbish the dam wall with minimal need to augment this material by mixing in externally sourced soils. Additional material outside the site boundaries can be sourced if necessary.
- 2) If there are limitations to the availability of locally sourced clay, as an alternative to a clay blanket and clay key, the dam's impermeable lining will be constructed using embedded HDPE sheeting. The HDPE sheet would be tied into the bed at the upstream toe of the embankment and provided with a suitable protective cover. The HDPE sheeting is to be safely treated to ensure that sheet degradation from rodents is mitigated.
- 3) Construction of a new spillway and the refurbishment of the existing outfall structures
- 4) Use of locally sourced materials to widen and strengthen the dam

### *Community Engagement*

Roness reservoir is well-positioned to provide a water supply to much of Pong Teuk, Kep, Angkaol and Prey Thom Communes and as such the majority of the communities will have a stake in its refurbishment and will be supportive of any works. As identified above, there is a small community of approximately 50 people living in a village immediately to the east of Roness Dam, some of whom currently cultivate land within the reservoir footprint. It will be necessary to engage with these people to ensure they are able to effectively adapt to any change in the reservoir water level that occurs at a later date following completion of the investigation and design proposed in this investment.

### *Construction*

The existing dam material will be re-used and strengthened as much as possible. Other details of the physical works are as above.

### **Contractor Requirements**

The geotechnical investigation should be carried out under the instruction of a qualified dams engineer to advise on the specific placing of boreholes and monitoring wells.

## *Key Risks & Safeguarding Issues*

### § Environmental

The works will require drilling and construction machinery and materials to be brought to site, and the existing road may require modification to enable access. Any disruption as a result of the road works should be kept to a minimum.

### § Social Safeguards

Full engagement should take place with the neighbouring community and training put in place with the workforce to ensure good working relations are maintained throughout the works.

### § Gender/Youth (if applicable)

No safeguarding issues identified

For more details, see screening, below and Part II, Section K of the proposal.

## PHOTOS



**Figure 2** *“Downstream face of the dam with dense vegetation and root bole damage.”*



**Figure 3** *“View along the crest of the dam showing eroded embankment face and vegetation on the downside of the dam”*

**Figure 4** *“View along the upstream face of the dam showing the over-steepened and eroded embankment face.”*





**Figure 5** *“View along east side of reservoir, showing upstream face with some vegetation.”*





**Figure 6** *“Downstream face showing access road ramp up to crest, dense vegetation and proximity of railway line.”*



*Figure 7 “View downstream from the main outlet sluice showing the apron and the railway culverts.”*

**Table 1**

<b>Environmental and Social Safeguard Principle</b>	<b>Risk Mitigation Actions Incorporated in The Design</b>
<p><b><i>Compliance with the law</i></b>                      Projects/programmes supported by the Fund shall be in compliance with all applicable domestic and international law.</p>	<p>There are no anticipated legal issues</p>
<p><b><i>Access and Equity</i></b>                      Projects/programmes supported by the Fund shall provide fair and equitable access to benefits in a manner that is inclusive and does not impede access to basic health services, clean water and sanitation, energy, education, housing, safe and decent working conditions, and land rights. Projects/programmes should not exacerbate existing inequities, particularly with respect to marginalized or vulnerable groups.</p>	<p>This investment will deliver improved access to fresh water for poor farming communities, which will improve their capacity to grow crops for domestic use and sale.</p>
<p><b><i>Marginalised and Vulnerable Groups</i></b>                      Projects/programmes supported by the Fund shall avoid imposing any disproportionate adverse impacts on marginalized and vulnerable groups including children, women and girls, the elderly, indigenous people, tribal groups, displaced people, refugees, people living with disabilities, and people living with HIV/AIDS. In screening any proposed project/programme, the implementing entities shall assess and consider particular impacts on marginalized and vulnerable groups.</p>	<p>There are no anticipated issues regarding marginalised groups.</p>
<p><b><i>Human Rights</i></b>                      Projects/programmes supported by the Fund shall respect and where applicable promote international human rights.</p>	<p>There are no anticipated issues regarding human rights.</p>

<p><b><i>Gender Equity and Women's Empowerment</i></b>  Projects/programmes supported by the Fund shall be designed and implemented in such a way that both women and men 1) have equal opportunities to participate as per the Fund gender policy; 2) receive comparable social and economic benefits; and 3) do not suffer disproportionate adverse effects during the development process.</p>	<p>In the poor communities affected by the proposal it was observed that women tend to take more of a household and community management role and therefore they are likely to benefit further from the community's improved crop yield, as they will be likely to take on the role of selling surplus crops. The men will benefit from improved yields from their labours.</p>
<p><b><i>Core Labour Rights</i></b>  Projects/programmes supported by the Fund shall meet the core labour standards as identified by the International Labour Organization.</p>	<p>There are no anticipated issues regarding core labour rights.</p>
<p><b><i>Indigenous People</i></b>  The Fund shall not support projects/programmes that are inconsistent with the rights and responsibilities set forth in the UN Declaration on the Rights of Indigenous Peoples and other applicable international instruments relating to indigenous peoples.</p>	<p>The water reservoir enhancement will not harm the life of indigenous people. There is no evidence of indigenous people in the target area.</p>
<p><b><i>Involuntary Resettlement</i></b>  Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids or minimizes the need for involuntary resettlement. When limited involuntary resettlement is unavoidable, due process should be observed so that displaced persons shall be informed of their rights, consulted on their options, and offered technically, economically, and socially feasible resettlement alternatives or fair and adequate compensation.</p>	<p>There is no resettlement required as a result of this investment. There will need to be consultation and engagement with the community currently growing crops within the reservoir footprint to identify if alternative livelihoods are required.</p>

**Protection of Natural Habitat**

The Fund shall not support projects/programmes that would involve unjustified conversion or degradation of critical natural habitats, including those that are (a) legally protected; (b) officially proposed for protection; (c) recognized by authoritative sources for their high conservation value, including as critical habitat; or (d) recognized as protected by traditional or indigenous local communities.

This investment will help to improve safety and functionality of the dam. Although construction works will affect the local rural environment while the dam is being rebuilt, these measures will reduce the risk of dam failure and the damage to the natural environment that would result from such a failure.

**Conservation of Biological Diversity**

Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids any significant or unjustified reduction or loss of biological diversity or the introduction of known invasive species.

There are no anticipated issues with biodiversity.

**Climate Change**

Projects/programmes supported by the Fund shall not result in any significant or unjustified increase in greenhouse gas emissions or other drivers of climate change.

This investment will help to better understand the local effects of climate change for the poor local communities, and enable more effective adaptation. There will be necessary but controlled CO2 emissions associated with the construction period only.

**Pollution Prevention and Resource Efficiency**

Projects/programmes supported by the Fund shall be designed and implemented in a way that meets applicable international standards for maximizing energy efficiency and minimizing material resource use, the production of wastes, and the release of pollutants.

Environmental safeguards should be applied during the geotechnical investigation and construction works to ensure no oils or cement are allowed into the environment.

**Public Health**

Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids potentially significant negative impacts on public health.

This investment should benefit public health by improving crop production. There are no anticipated negative effects.

***Physical and Cultural Heritage***

Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids the alteration, damage, or removal of any physical cultural resources, cultural sites, and sites with unique natural values recognized as such at the community, national or international level. Projects/programmes should also not permanently interfere with existing access and use of such physical and cultural resources.

There are no anticipated issues regarding physical and cultural heritage.

***Land and Soil Conservation***

Projects/programmes supported by the Fund shall be designed and implemented in a way that promotes soil conservation and avoids degradation or conversion of productive lands or land that provides valuable ecosystem services.

This investment will facilitate the longer-term improvement in water supply to the community. This will reduce the instances of soil loss and degradation during the dry season and thereby reduce nutrient loss.





# HOUSING RESILIENCE

*Output 3.5 Resilient Housing Designs Implemented*

## INTRODUCTION



<b>Deliverables</b>	<ul style="list-style-type: none"> <li>Resilient Housing</li> <li>Automated Early Warning Systems</li> </ul>
<b>Beneficiaries</b>	9,720
<b>Budget</b>	\$89,000
<b>Location</b>	All Communes

*Problem statement*

Poor and marginalised households tend to be less resilient and face greater difficulties in absorbing and recovering from the impacts of natural disasters. Recurrent disasters also compound losses for many households, forcing them to organize their livelihood such that overall risks can be reduced in the face of uncertainty, even if it means a reduction in their income and increased poverty (UNISDR 2009b).

Consultation with local communities and site investigations have corroborated that housing in the local communities are vulnerable to strong winds - in some communes up to 80% of housing is damaged by strong winds on an annual basis.

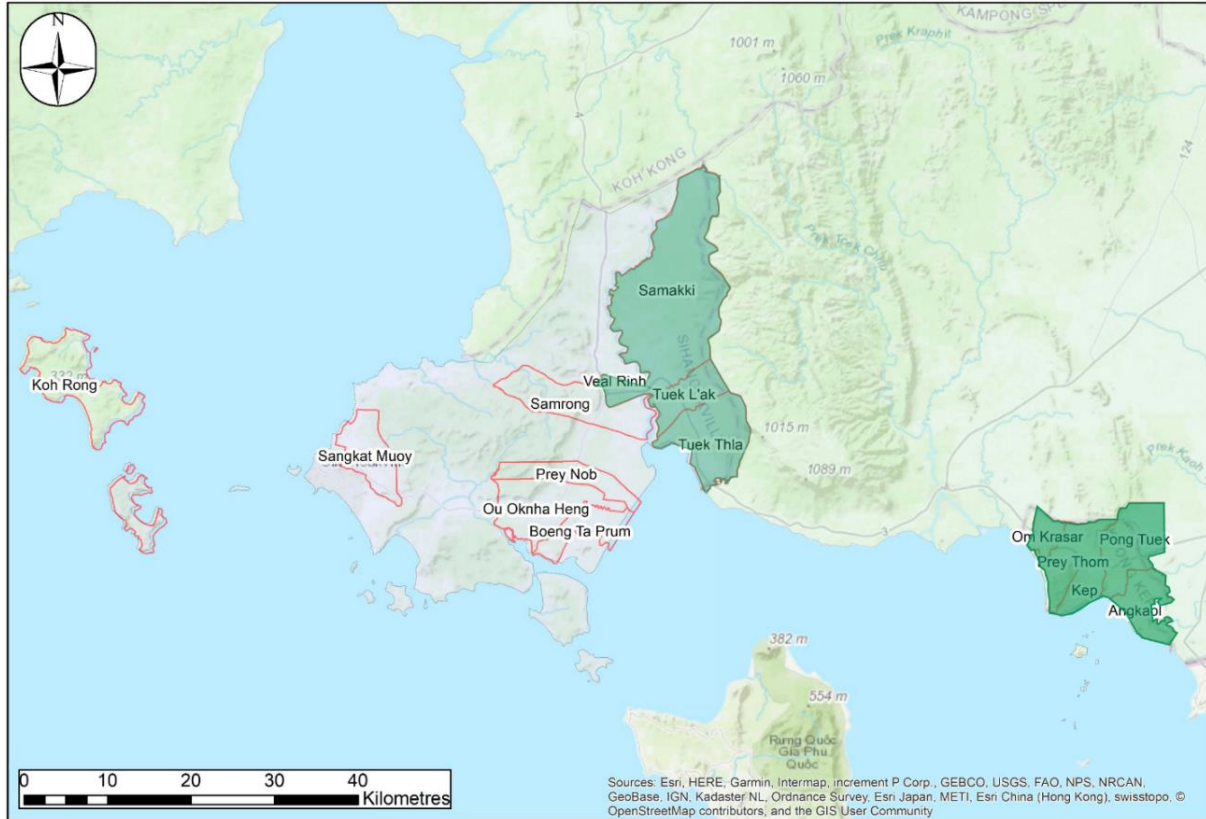
Resilience to natural hazards refers to the ability to protect lives, livelihood and infrastructure from destruction and damage, and to the capability of communities to rebuild following a natural disaster. This project seeks to improve the resilience of the affected communes and reduce their vulnerability to environmental hazards through the provision of education and training for local people to create local capacity to facilitate the construction of safe and resilient housing, provide new economic and livelihood options.

The poor are already resilient, by both nature as well as necessity. However, further funding, information, and support are needed to empower them to escape poverty traps and better cope with climate change-related disasters.

**Location**

**Resilient Housing**

The housing resilience program will be focused on communes identified to be susceptible to weather related disasters.



**Figure 1** Location of Communes within Prey Nob and Kep Province. Housing resilience program to be targeted at communes shaded in green.

In Prey Nob District, the investment will focus on the following communes (being those that were deemed particularly susceptible to strong winds following consultation with the local community and associated site visits):

- Teuk Thla
- Teuk L'ak
- Samaki
- Veal Rinh

In Kep Province, the investment will focus on the following communes (being those that were deemed susceptible to strong winds following consultation with the local community and associated site visits):

- Angkaol
- Pong Teuk
- Prey Thom
- Kep

- Ou Krasar

## Beneficiaries

	Beneficiaries	Quantity	Beneficiaries
Housing Resilience	Training workshop attendees	2000 Families (or 10,000 People Approx.)	\$89,000/10,000 = \$8.9

## BUDGET

### Budget for Resilient Housing

Description	Quantity	Unit Price	Cost
<b>Project Preparation Phases</b>			
- Development of 'demo' building drawings	10 days	\$300 per day	\$3000
- Development of building manuals	20 days	\$300 per day	\$6,000
<b>Construction of Demo Houses (In Kep and Prey Nob Provinces)</b>			
- Construction of Traditional Style Demo Houses with Latrine and Storm-water Tanks (one in each province) (1)	2	\$15,000	\$30,000
- Construction of Masonry Style Demo Houses with Latrine and Storm-water Tanks (one in each province) (1)	2	\$15,000	\$30,000
- Engineering Input	10 days	\$300 per day	\$3000
<b>Training Seminars</b>			
- 2 highly skilled tradesmen to run educational programs (50 sessions in total at 3 hours per session) – Assume 20 attendees each class.	100 x 4 hours sessions	\$20 per hour	\$8000
- Engineer to train tradesmen and run preliminary courses.	10 days	\$300 per day	\$3000
- Training Materials	-	-	\$1000
- Miscellaneous Costs	-	-	\$5000

**TOTAL****\$89,000**

Note:

(1) Housing construction costs are as reported by the commune leader for Pong Teuk on 19 October 2018 with allowance for necessary modifications.

## DATA COLLECTION

### *Inputs*

The following inputs were used for the development of this investment:

- Community Consultations (Refer to the proposal [Part II, Section H](#))
- Site Records and Observations

### *Consultations*

Consultation with communes were undertaken to understand the impact of strong winds and flooding on the specific communes. The relevant dates of consultation sessions wherein the vulnerability to strong winds and flooding hazards were identified are as follows:

- 16 October 2018 – Meeting with Kep Municipality
- 17 October 2018 – Meeting with Kep Province Department of Water Resources and Meteorology
- 18 October 2018 - Meeting with Angkaol Commune
- 19 October 2018 - Meeting with Pong Teuk Commune
- 20 October 2018 - Consultation with Preah Sihanouk Department of Meteorology and Water Resources
- 22 October 2018 - Consultation with the Eight Communes of Prey Nob District

Key takeaways from these consultation sessions are as follows:

- Teuk L'ak, Teuk Thla, Samakki and Veal Rinh communes are particularly affected by high winds;
- Prey Nob and Ou Okhna Heng are affected by localised flooding;
- Kep province is particularly susceptible to high winds;
- 175 houses were damaged in Pong Teuk Commune on the 18th of October 2018 by a storm, while the consultations were taking place. The team visited some of the damaged houses and assessed the damage. At least 150 houses are typically damaged on an annual basis;
- In some communes, up to 80% percent of houses are damaged by high winds on an annual basis;
- Both masonry and wooden houses are susceptible to wind damage;
- irrespective of housing style, roof and wall construction quality typically with construction defects are at risk during high winds;

- All communes are affected by sanitation issues due to poorly constructed septic tanks and/or improper waste disposal methods;
- Solid waste causes drainage blockages and are compounding sanitation issues;
- Water quality is perceptibly worse during the dry season where fresh water availability is reduced.

## *Site Records*

### *Coastal Cambodia Building Style Observations*

In poor communities along the southern coast of Cambodia, traditional building styles are prevalent. Construction of housing stock is often mixed with both modern and traditional materials and building techniques.

**Building Arrangement:** The traditional Khmer house is typically a rectangular home with dimensions generally between 4x6m to 6x10m. Homes either sit directly on the ground, or more typically, on stilts (typically 3m above the ground). This is to avoid annual flooding, protect against petty theft, provide natural cooling and allow for the storage of animals and equipment under the house. Access provided by concrete or wooden stairs. Elevation above ground level facilitates the provision of shade for daily life activities at ground level during the day (Refer to Figure 8 & 28).

**Roofs:** Whilst the roofs of traditional housing are typically of gable thatch roof construction it was noted that most of the existing housing stock in the region including new homes were typically constructed with corrugated steel gable roofs (Refer to Figure 9,10, 26 & 28).

**Room Arrangements:** The simplest houses consist of only one room on the upper floor (Refer to Figure 14), partitioned off to provide a storage place for rice, a bedroom for the parents, and further space for unmarried daughters.

**Foundations:** Foundations typically consist of timber or concrete load-bearing piles nested on concrete foundations (Refer to Figure 8, 19). For very loamy soils, wooden piles are driven up to 2m in depth to stabilize the foundation.

**Wall cladding:** Houses of the most marginalized are generally clad with palm leaf matting which is directly fixed to the structural framework (Refer to Figure 14). Fine bamboo struts are often used to anchor the matting. In more sophisticated houses wooden boards are used to clad the walls (Refer to Figure 8), aligned either horizontally or vertically. Walls for new homes are typically of masonry construction (Refer to Figure 26).

**Ventilation:** Housing stock is typically absent of electric or mechanical air conditioning. A draught-free environment is obtained through natural ventilation. In more modern masonry houses, natural ventilation is often provided through the inclusion of 'air bricks' along the façade of the building (Refer to Figure 13).

To maximise effectiveness and adoption from beneficiaries, proposed resilient housing designs are to consider the aforementioned local cultural sensibilities and borrow heavily from local building styles (Audefroy, 2010).

### *Issues with Existing Housing Construction*

The following is a brief summary of issues identified within the existing housing stock during initial site visits to the local communes. Identified issues are typically associated with construction defects, poor workmanship, unsuitability of construction with local site context and/or poor local building techniques:

- Corrugated roof sheeting of inadequate thickness when subject to corrosion and absent of washers at fixing locations are highly susceptible to tears at fixings during high wind events (Refer to Figure 17, 23);
- Roofing projecting too far beyond the external wall edge and are therefore at higher risk of high uplift loads during wind events (Refer to Figure 21);
- Roof beam spacing too large and at risk of failure under loading (Refer to photo 24);
- Corrugated roof sheeting reliant on nails in lieu of more robust fixings such as screws for connection into roof beams (Refer to Figure 16, 17, 23, 25);
- Poorly constructed building joints with no steel straps or tie downs to mitigate high tension and compression forces at joints (Refer to Figure 21, 22);
- Poor material quality of insufficient thickness or strength (Refer to Figure 15);
- Foundations are sufficiently imbedded within the soil and subject to pull-out (Refer to Figure 19,20);
- Timber posts are not adequately attached to the concrete foundation (Refer to Figure 19,20);
- No use of diagonal bracing to stabilise the timber structure from lateral loads induced by wind and flood water (Refer to Figure 14);
- Housing stock insufficiently elevated from ground level in flood prone areas (Refer to Figure 1, 10, 27);
- Housing stock have larger exposure to wind forces due insufficient planting of protective vegetation to form a natural wind buffer against prevailing winds (Refer to Figure 26);

### ***Increased Adoption of Masonry Construction***

Cambodian people are finding it more difficult to acquire the raw timber materials needed and are resorting to more modern materials such as brick, cement and corrugated sheeting.

Distribution of masonry houses (Refer to Figures 9, 13 & 26) appeared to be more prevalent along main roads, with more traditional timber housing styles evident along rural roads (Refer to Figure 7, 8, 28). This is an indication that those with better means are opting for newer construction styles and materials. However, this doesn't necessarily make them less likely to be impacted by strong winds.

New housing stock and housing under construction typically appeared to be of a masonry style construction (Refer to Figure 26).

Whilst the primary residences appeared increasingly built from masonry and concrete elements, secondary residences, storage, animal pens, and sanitation structures were typically of timber construction and of substantially poorer quality (Refer to Figure 11).

Increased adoption of masonry and concrete elements for housing construction is consistent with information received during consultation sessions with the local communes. The Chief of Pong Teuk Commune informed the design team that homes built from masonry and concrete are favoured due to

their greater resilience to extreme weather and competitive costing due to limited availability of timber materials. The Pong Teuk Commune leader also informed us that well-built traditional homes were, as of recent times, potentially costing more than concrete and masonry house construction.

Based on the team's post-strong wind event site investigation on the 18th of October 2018, damage to residences were typically to roofing elements. On that date, over 175 residences were reportedly damaged according to the Chief of Pong Teuk Commune. Damage also extended to properties of masonry construction where (following a site inspection) it was evident that roof construction was not adequate. Specifically:

- Masonry to beam connections (Refer to Figure 25);
- Roof beam to roof beam connections (Refer to Figure 24); and
- Corrugated sheet to roof beam connections (Refer to Figure 17, 23).

Based on the increased adoption of concrete and masonry house construction and evidence that masonry houses are affected by environmental factors, it is proposed that any training on building practices provided to communes (in addition to the repair and construction of traditional timber houses) include training on construction methodology for masonry houses to address key construction shortcomings.

### ***Quality of Building Materials***

One of the key issues of housing construction within these provinces is the availability of suitable materials. Refer to Figures 7, 11, 14, 15, 16, 20, 21,22, where the use of poor quality building materials (i.e. insufficient material strength and thickness and poor fixings) is evident.

With the reduced availability of quality timber due to historic deforestation, and the consequential use of inferior timber material in housing construction, for the poor there is an increased susceptibility to environmental impacts due to poor housing infrastructure.

The proposed training and workshops to be provided as part of this investment is to emphasize the importance of quality building materials, and to provide guidance on which materials/techniques allow for quality, low cost construction. Locally-available precast construction elements for incorporation into housing construction in lieu of other materials is to be evaluated as part of these workshops.

### ***Assessment of Environmental Impacts to Housing***

Based on consultation sessions with the communes, susceptibility of housing to wind events is a recurrent issue for the community, with hundreds of houses being damaged on an annual basis. There is a clear need to improve housing resilience in the region for wind-based events, particularly with respect to wall bracing and roof construction.

Despite identifying water marks clear above floor level for many housing structures, flooding was perceived as lesser of an issue for the community. It was noted that most traditional houses were built elevated from the ground and therefore protected from low level flood waters. Masonry houses on the other hand, were observed to be of sufficient strength to weather minor flood events.

With rising sea levels and houses being increasingly built of masonry construction flush with the ground level, there is an increasing risk of housing infrastructure susceptibility to larger flood events. To reduce the risk, communes should carry out hazard mapping to identify areas at higher flood risk. Furthermore,



flood protection requirements for 1 in 100-year flood events should be articulated in educational programmes associated with housing resilience.

### ***Protective Vegetation***

Housing, where protected by a shelterbelt of vegetation, were reported by local residents as more resilient against strong winds. It is recommended that housing resilience educational programmes include information on the introduction of vegetation shelterbelts as cost effective wind protection.

### ***Stormwater Retention***

With water of increasingly greater scarcity in the area, safe drinking water harder to access, existing housing stock and new housing stock should incorporate storm water storage from roof runoff. Poor access to quality drinking water is reiterated by the local residents who reportedly at relative high cost and effort purchase water from distant reservoirs.

Rainwater is considered to be of very high quality by both recipients and non-recipients and was thus used extensively where available. The annual rainfall in the regions, which is in excess of 1400mm per year, can facilitate rain water harvesting efforts in the region. Costs for domestic rainwater tank reportedly range from US\$160 for a jumbo jar to US\$250 a concrete ringed tank (Refer to Figure 12).

### ***Sanitation***

Poor sanitation facilities have been identified as an issue during by both community consultations and on-site visits. Sanitation and hygiene awareness workshops should be carried out which emphasise the importance of latrines uses with activities and visual representations to connect open defecation to river water, which people might drink. Participants should understand the importance of latrines and be motivated to build one in their home (Refer to Figure 11).

Research by the World Bank's Water and Sanitation Programme published in 2012 argued that more than half of the Cambodian households that lack a latrine could, in fact, afford one.

### ***Papers***

Some of the most relevant literature reviewed include:

#### *Shelter and disaster risk reduction:*

- ADRC (2012) Natural Disaster Data Book 2010: An Analytical Overview. Kobe, Asian Disaster Reduction Center (ADRC).
- Lyons, M. et al (eds) (2010) Building Back Better: Delivering People-Centered Housing Reconstruction at Scale. Rugby (UK), Practical Action Publishing.
- Tran Tuan Anh (2017). Developing Design Options for Housing in Disaster-prone Areas of Central Vietnam. RMIT University.
- Tran Tuan Anh, Tran Van Giai Ph (2013). Community consultation for long-term climate-resilient housing in Vietnamese cities: a comparative case study between Hue and Da Nang. Asian Cities Climate Resilience.

- Dr Esther Charlesworth, Dr Ifterkhar Ahmen (2012). Scoping Study: Shelter and Disaster Risk Reduction in the Asia-Pacific Region. Humanitarian Architecture Research Bureau (HARB), RMIT University.

*Lessons from past projects:*

- Aquilino, M.J. (2011) *Beyond Shelter: Architecture and Human Dignity*. New York, Metropolis Books.
- UN-Habitat and IFRC (2009, 2010 and 2012) *Shelter Projects*. Fukuoka and Geneva, UN-Habitat and the International Federation of Red Cross & Red Crescent Societies (IFRC). Evaluation frameworks:
- AusAID (2005) *AusAID (2005) AusGuideline: The Logical Framework Approach*. Canberra, AusAID.
- Twigg, J. (2007) “Evaluating Disaster Risk Reduction Initiatives” in Benson, C. and Twigg, J. (2007) *Tools for Mainstreaming Disaster Risk Reduction: Guidance Notes for Development Organisations*. Geneva, International Federation of Red Cross and Crescent Societies and ProVentio Consortium.
- Lizarralde, G. (2002) “Organizational Design, Performance and Evaluation of PostDisaster Reconstruction Projects”. Conference proceedings, *Improving Post-Disaster Reconstruction in Developing Countries*. Montreal, Université de Montréal.
- J.F. Audefroy, B.N.C. Sánchez, *Integrating Local Knowledge for Climate Change Adaptation in Yucatan, Mexico*, *International Journal of Sustainable Built Environment* (2017), doi: <http://dx.doi.org/10.1016/j.ijsbe.2017.03.007>

### **Housing Resilience Design**

#### *Stage 1 - Project Preparation Works*

Project preparation works are to take consideration of the following key consideration to ensure that the housing resilience works are adequately implement with appropriate consideration of the local context:

- **Housing Resilience Literature:** Mobilised project team to undertake a literature review on disaster resilient shelter construction and leading practices.
- **Local Construction Practices:** Undertake an assessment of local building practices and architectural styles, based on previous work conducted by UN-Habitat in Cambodia. The programme will be tailored to suit the local context and local culture. The assessment will analyse cultural requirements regarding functional spaces, housing styles, typology, materials and local construction techniques. Local availability of housing precast construction elements to be evaluated. Note that the assessment will take place under Output 1.2 of the project, and its findings implemented here.

*Note: Design without adequate local representation and cultural sensibility are very likely to create conflict or even rejection from beneficiaries (Audefroy, 2010) and subsequently result in the ineffectiveness and unsuitability of rebuilt houses for future disasters.*

- **Hazard Mapping:** Undertake housing and community multiple hazard assessment and ranking to produce community-based climate and disaster mapping and planning. Hazard mapping to

take into account sea level rise, projected flood levels for 1 in100 year flood, local accounts of flood and wind prone areas.

*Note: Evaluation tool detailed within Section 4.1 of paper Scoping Study: Shelter and Disaster Risk Reduction in the Asia-Pacific Region by Humanitarian Architecture Research Bureau (HARB) wherein an evaluation framework when undertaking this exercise with local communities is provided.*

- Demo Housing Locations: In coordination with local commune leaders identify sites within Kep province and the affected Prey Nob communes wherein construction of demonstration houses are ideal. Location to be located near to transportation routes and suitable for training workshops to be held.
- Implementation Documentation: Produce implementation documentation including detailed construction documentation (taking into consideration local context, commune specific hazards and commune consultation), a training curriculum and an implementation plan.
- Development of Monitoring Procedures: To ensure effective coordination and management of housing resilience projects, monitoring procedures and checklists to be developed for the respective stages of the project to facilitate tracking of project progress against the success criteria and compliance with the established standards. Plan to include report project success vis-à-vis success criteria and reporting on lessons learned from both successes and failures.

#### *Stage 2 - Approvals*

Submit Housing Resilience Documentation and attain formal approval from the Provincial Department of Land Management, Urban Planning and Construction, and Provincial Hall of Preah Sihanouk and Kep Provinces.

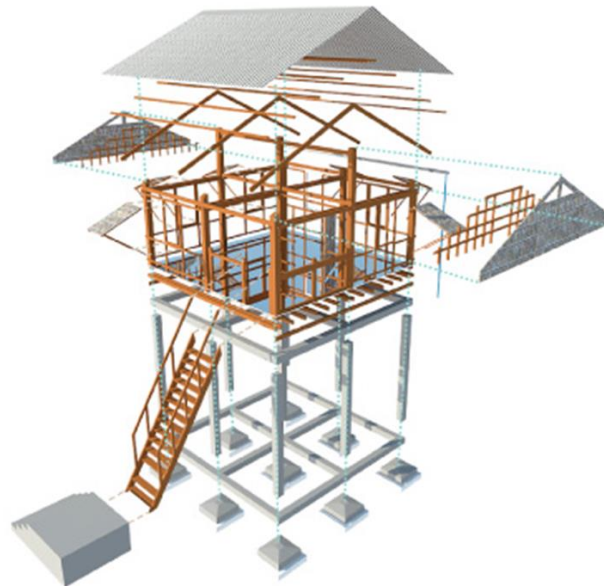
#### *Stage 3 – Program Implementation*

The investment will be implemented as per the implementation documentation plan and documentation produced within the Stage 1 works. Works within this phase includes, but not exclusive to:

- Construction of Demo Houses (Refer to Figure 5) and associated latrines / storm water tanks;
- Identification of beneficiaries within local community i.e. members suitable to attend the capacity building workshops (“Local Capacity Building Workshops”);
- Training and Local Capacity Building Workshops:
  - Workshop on identifying and understanding commune specific hazards inclusive of hazard mapping
  - Workshop on construction materials and technical detailing
  - Workshops on house layouts and associated construction budgeting
  - Sanitation and hygiene awareness workshops promoting healthy behaviours and latrine use
- Development and distribution of design manuals for workshop attendees; and
- Ongoing program monitoring and evaluation to assess effectiveness of the workshops.



**Figure 3** *“3D Isotropic deconstructed view of sample demonstration house. Demo house arrangements and construction details to be adjusted following completion of the stage 1 works.”*



## ***Community Engagement***

Key to the success of the investment is ensuring community involvement in the development of housing styles with construction techniques suitable for the local context. Community involvement in the development of hazard maps is also critical.

### *Construction Requirements*

A structural engineer trained in housing resilience will be involved in the development of the implementation plan and associated documentation. The structural engineer will also be required to train staff involved in the investment as well as supervise its initial implementation.

### *Key Risks & Safeguarding Issues*

There are no significant risks or safeguarding issues. Refer to the safeguards section in [Annex 3](#) of this proposal for details.

# SAFEGUARDS

Environmental And Social Safeguard Principle	Risk Mitigation Actions Incorporated In The Design
<p><b>Compliance with the law</b>            projects/programmes supported by the Fund shall be in compliance with all applicable domestic and international laws.</p>	<p>There are no anticipated legal issues</p>
<p><b>Access and Equity</b>            Projects/programmes supported by the Fund shall provide fair and equitable access to benefits in a manner that is inclusive and does not impede access to basic health services, clean water and sanitation, energy, education, housing, safe and decent working conditions, and land rights. Projects/programmes should not exacerbate existing inequities, particularly with respect to marginalised or vulnerable groups.</p>	<p>This investment will provide educational benefits</p> <p>This project should not exacerbate existing inequities. Education opportunities provided within this project will be targeted to the marginalised and/or enhance the local capacity of the region which is in turn beneficial to all.</p> <p>The Automated Weather Station (AWS) is to be a government owned and operated entity used to improve weather forecasting and data. This service is beneficial to all in the region.</p> <p>Beneficiaries have been identified as poor families, meaning that both men and women will have access to the benefits of the investment. A representative sample of Cham Muslims, who live in the target area, will be included in the housing resilience activities, giving them equal opportunity to be benefit from this investment.</p>

<p><b>Marginalised and Vulnerable Groups</b>  Projects/programmes supported by the Fund shall avoid imposing any disproportionate adverse impacts on marginalised and vulnerable groups (including children, women and girls, the elderly, indigenous people, tribal groups, displaced people, refugees, people living with disabilities, and people living with HIV/AIDS). In screening any proposed project/programme, the implementing entities shall assess and consider the impact on marginalised and vulnerable groups.</p>	<p>There are no anticipated issues regarding marginalised groups and vulnerable groups.</p> <p>This project will:</p> <ul style="list-style-type: none"> <li>• Provide new economic and livelihood options to the marginalised;</li> <li>• Improve housing resilience for the marginalised and vulnerable.</li> </ul> <p>Otherwise, please see above under ‘Access and Equity’</p>
<p><b>Human Rights</b>  Projects/programmes supported by the Fund shall respect, and where applicable, promote international human rights.</p>	<p>There are no anticipated issues regarding human rights.</p>
<p><b>Gender Equity and Women’s Empowerment</b>  Projects/programmes supported by the Fund shall be designed and implemented in such a way that both women and men 1) have equal opportunities to participate as per the Fund gender policy; 2) receive comparable social and economic benefits; and 3) do not suffer disproportionate adverse effects during the development process.</p>	<p>The housing resilience project will aim to provide equal training opportunities to both men and women.</p> <p>The Automatic Weather Station is of equal benefit to men and women</p>
<p><b>Core Labour Rights</b>  Projects/programmes supported by the Fund shall meet the core labour standards as identified by the International Labour Organization.</p>	<p>There are no anticipated issues regarding core labour rights.</p>
<p><b>Indigenous People</b>  The Fund shall not support projects/programmes that are inconsistent with the rights and responsibilities set forth in the UN Declaration on the Rights of Indigenous Peoples and other applicable international instruments relating to indigenous peoples.</p>	<p>There are no indigenous people in the project’s target area.</p>

***Involuntary Resettlement***

Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids or minimizes the need for involuntary resettlement. When limited involuntary resettlement is unavoidable, due process should be observed so that displaced persons shall be informed of their rights, consulted on their options, and offered technically, economically, and socially feasible resettlement alternatives or fair and adequate compensation.

There is no resettlement required as a result of this sub-project.

The provision of improved housing resilience and construction techniques does not imply resettlement for any of the beneficiaries. Rather, it is designed to empower them improve their own dwellings in a manner suited to their own context.

***Protection of Natural Habitat***

The Fund shall not support projects/programmes that would involve unjustified conversion or degradation of critical natural habitats, including those that are (a) legally protected; (b) officially proposed for protection; (c) recognized by authoritative sources for their high conservation value, including as critical habitat; or (d) recognized as protected by traditional or indigenous local communities.

The housing resilience programme seeks to improve the quality of new and existing housing stock. With this program there should be a reduction in housing repairs and therefore, a reduction in the consumption of building materials. An overall reduction in material used for construction should be beneficial with respect to the preservation of natural habitats.

Moreover, the capacity building emphasis the benefits that natural buffers (primarily in the form of trees) can provide. This is complementary to the protection of natural habitats.

***Conservation of Biological Diversity***

Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids any significant or unjustified reduction or loss of biological diversity or the introduction of known invasive species.

The housing resilience program seeks to improve the quality of new and existing housing stock. With this program, there should be a reduction in housing repairs and therefore, a reduction in the consumption of building materials. An overall reduction in materials used for construction should be beneficial with respect to the preservation of natural habitats and associated biological diversity.

See also 'Protection of Natural Habitats', above.



<p><b>Climate Change</b> Projects/programmes supported by the Fund shall not result in any significant or unjustified increase in greenhouse gas emissions or other drivers of climate change.</p>	<p>This investment will help to offset the effects of climate change for the poor local communities through enhanced housing educational programmes which emphasise greater environment resilience.</p>
<p><b>Pollution Prevention and Resource Efficiency</b> Projects/programmes supported by the Fund shall be designed and implemented in a way that meets applicable international standards for maximizing energy efficiency and minimizing material resource use, the production of wastes, and the release of pollutants.</p>	<p>Environmental safeguards should be applied during the construction works to ensure no pollution or oils are allowed into the environment.</p>
<p><b>Public Health</b> Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids potentially significant negative impacts on public health.</p>	<p>The Automated Weather System should enhance public safety by assisting with adverse weather forecasting.</p> <p>The housing resilience program assists with the provision of safer housing for the marginalised during adverse weather events.</p>
<p><b>Physical and Cultural Heritage</b> Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids the alteration, damage, or removal of any physical cultural resources, cultural sites, and sites with unique natural values recognized as such at the community, national or international level. Projects/programmes should also not permanently interfere with existing access and use of such physical and cultural resources.</p>	<p>There are no anticipated issues regarding physical and cultural heritage.</p>

***Land and Soil Conservation***

Projects/programmes supported by the Fund shall be designed and implemented in a way that promotes soil conservation and avoids degradation or conversion of productive lands or land that provides valuable ecosystem services.

The housing resilience programme seeks to improve the quality of new and existing housing stock. With this programme there should be a reduction in housing repairs, and therefore, a reduction in the consumption of building materials. An overall reduction in materials used for construction should be beneficial with respect to the preservation of natural habitats and the ecosystem.

## PHOTOS



**Figure 4** *“Typical example of poorly constructed traditional house. This house is located in the Prey Thom commune.”*

*Figure 5 “Typical traditional house with traditional construction methods. This house is located in the Pong Teuk Commune”*





**Figure 6** *“Typical Masonry Style House. This house is in the Prey Thom Commune.”*



**Figure 7**      *“Typical housing construction for informal settlements along coastline. This house is located in Kep Commune.”*



**Figure 8** *“Typical external latrine construction/ arrangement. According to census data, in many communes, up to 70% of houses did not have their own latrine.”*

**Figure 9** *“Typical construction for external storm water tanks collecting water from rooftops. Few houses were equipped with these tanks.”*



**Figure 10** *“Example of higher quality corrugated sheeting construction. Use of screws with washers evident. Higher quality corrugated steel noted as composed of thicker material.”*

**Figure 11** *“Example of local internal construction styles. No bracing visible.”*





**Figure 12** *“Example of use of poor materials in local construction. Recurrent failure of critical elements reported as problematic by local populace.”*

**Figure 13** *“Example of the use of nails to secure roof members together. Nails are known to perform poorly under tension loading.”*



**Figure 14** *“Damaged corrugated roof sheeting that has been removed from masonry houses due to strong winds.”*

**Figure 15** *“Example of localised flood in areas sensitive to rainfall (frequently experienced where drainage is inadequate).”*



**Figure 16** *“Closeup of foundation failure identified in Figure 10. Foundation not secured into ground with evidence of previous failure.”*

**Figure 17** *“Timber identified has not been secured into concrete foundation.”*



**Figure 18** *“Example of poor joint construction with inadequate materials and construction quality. Example of poor joint construction.”*

**Figure 19** *“Use of nails inadequate under high loading.”*



**Figure 20** *“Closeup of foundation failure identified in Figure 10. Foundation not secured into ground with evidence of previous failure.”*

**Figure 21** *“Timber identified has not been secured into concrete foundation.”*



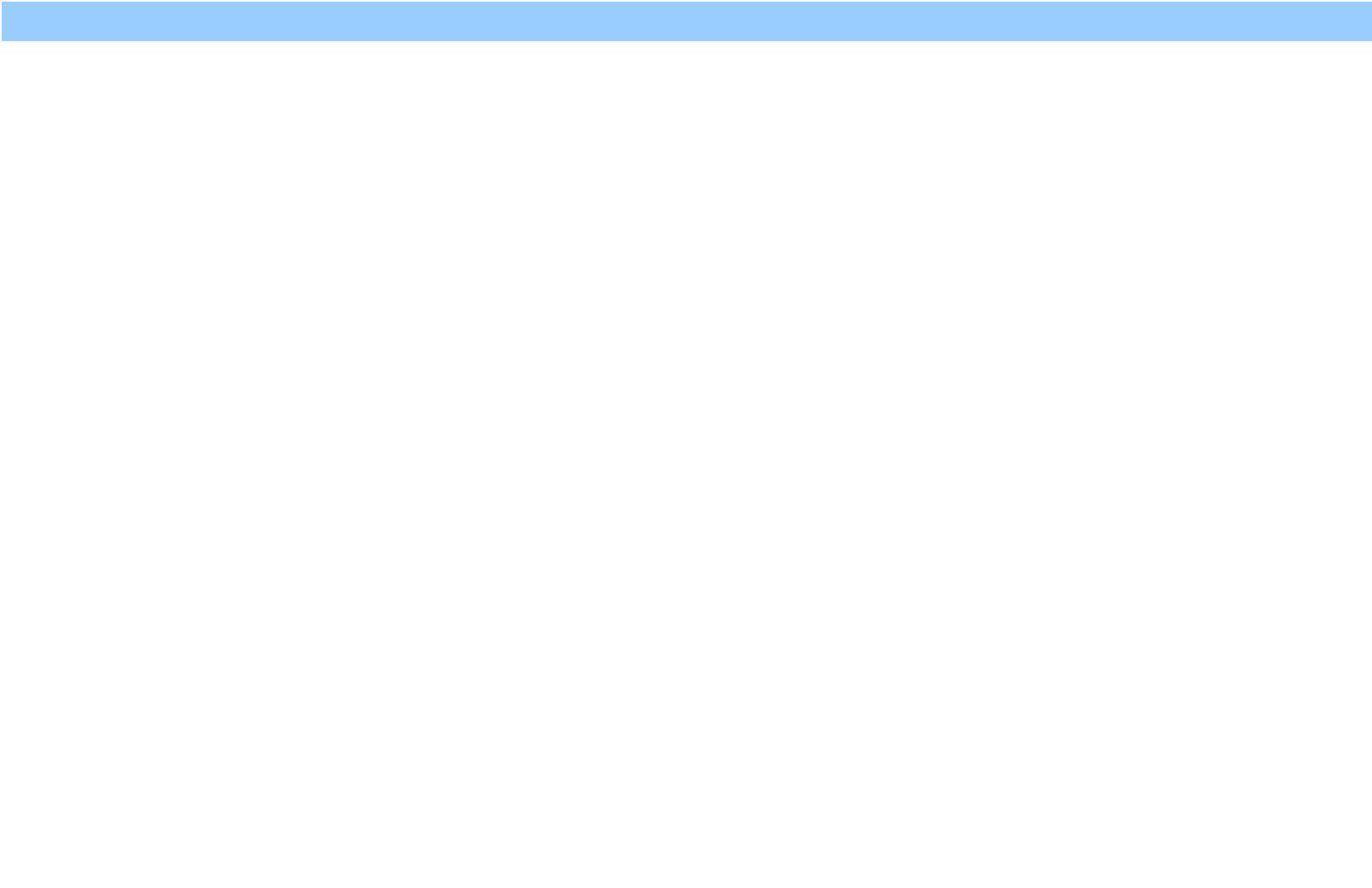
**Figure 22** *“Example of poor joint construction with inadequate materials and construction quality.”*

**Figure 23** *“Example of poor joint construction. Use of nails inadequate under high loading.”*



**Figure 24** *“Typical example of house construction style in flood prone areas.”*

**Figure 25** *“Additional example of traditional construction styles.”*



## 3.6 REPAIR OF WATER GATES AND LOW POINTS IN PREY NOB SEA DEFENCE

*Investment 3.6*

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### INTRODUCTION

#### *Problem Statement*

The communities of Prey Nob district lying on the west side of the Kampong Smach estuary have been protected from sea flooding since 2001 by an earth embankment and roadway separating the paddy fields from the mangrove forest. On the landward side of the embankment is a 30m wide flood drainage canal for conveying fresh water floods in the rainy season and this empties under the embankment through a series of 36 manually-operated vertical sluice gates. Repairs are required to several of the sluice gates. There are also locations where the current flood embankment is being overtopped in severe storms, approximately once every 2-3 years, and there is a need to identify low points as a preliminary measure

to any future project to raise and improve the embankment. Raising the entire embankment would incur costs above the current project budget but identifying low points will enable some targeted repairs improving the functionality of the existing flood embankment, will have immediate benefits and are within the scope of the project’s available budget.



Deliverables	<ul style="list-style-type: none"> <li>• Repairing water gates</li> <li>• Identifying low points in existing flood embankment</li> <li>• Repairing and raising low points in flood embankment</li> </ul>
Beneficiaries	20,000
Budget	US\$ 266,100
Location	Protects Ou Oknha Heng, Prey Nob, Ou Chou and Veal Rinh communes

### ***Location***

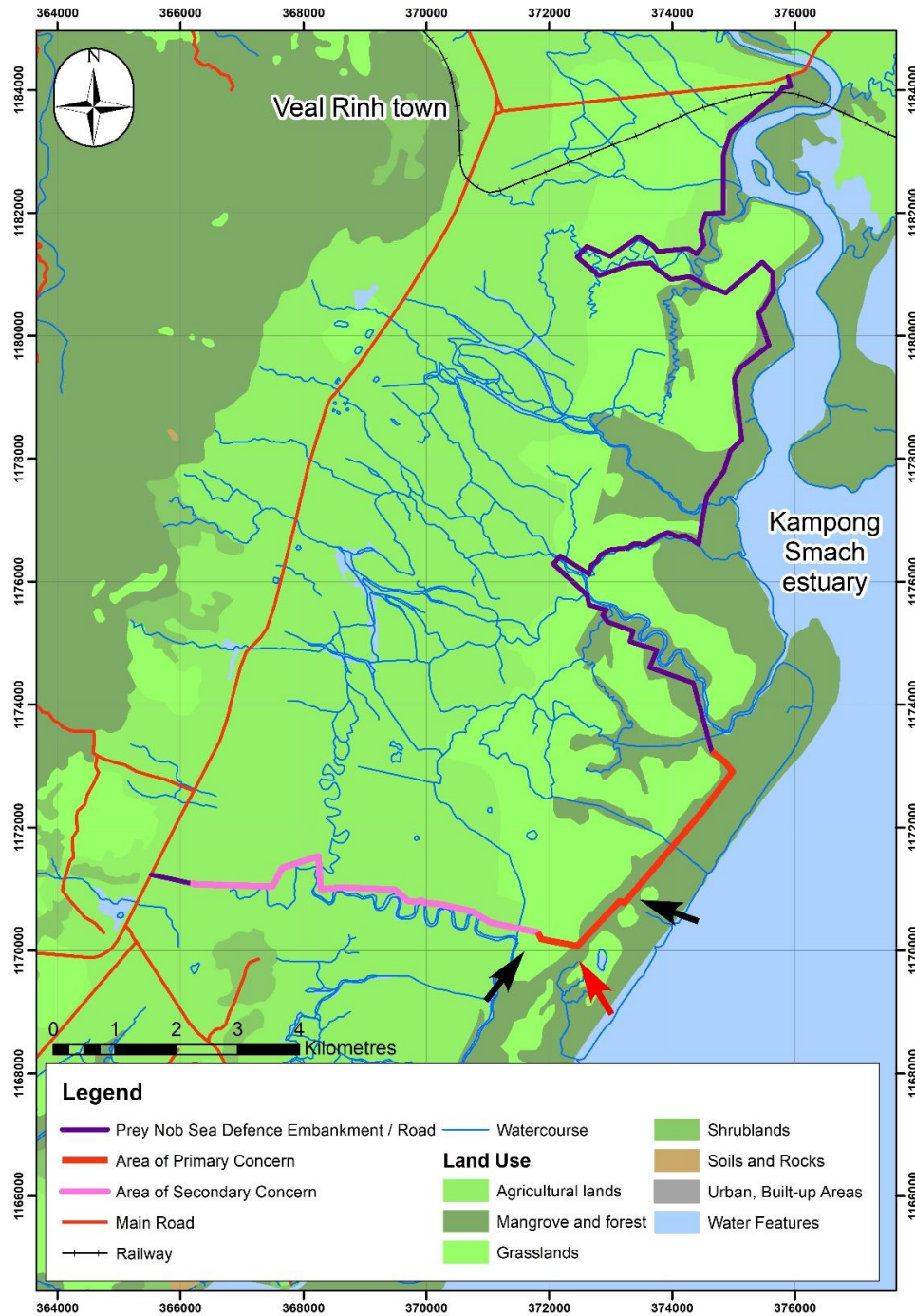
The existing flood embankment extends from the main road in Ou Oknha Heng Commune towards the sea and then turns north-east and continues between the existing mangrove and paddy fields to join National Road 3 just west of the bridge over Kampong Smach River. The area where the existing vertical sluice gates are reported to be not working correctly is near the southern corner (indicated on the map below), where two sets of gates are not functioning.

### ***Beneficiaries***

The existing sea defence protects houses and approximately 2,000 ha of paddy fields in the communes of Ou Oknha Heng, Prey Nob and Veal Rinh. The commune of Ou Chrou is also affected. In these communes there are 27,667 residents listed and it is understood that due to the low-lying nature of the coastal strip here a significant majority are directly affected by sea flooding and the entire community is affected by crop loss as a result of the flooding. Failure of the sluice gates in the open position will allow salt water ingress which will damage crops, and failure in the closed position will lead to fresh water flooding of the paddy fields during the rainy season as floodwaters would be restricted from egress to the sea. Identification and repair of the low points in the embankment will also reduce instances of salt water ingress.

Approximately 20,000 people are included as benefitting directly from this scheme.





**Figure 1** *Prey Nob sea defence embankment. The black arrows indicate locations of sluice gates requiring refurbishment and the red arrow indicates location of a gate requiring a new ladder. The areas indicated as of primary and secondary concern are those sections of the existing embankment where low points are being overtopped.*

## BUDGET

*Refurbishment of two water gates not currently working and replacement of ladder*

DESCRIPTION	QUANTITY	UNIT PRICE	COST
Provision of stop boards to enable access (approx..2.5m x 1m, 2 per gate)			\$ 500
New steel gates and mechanism and refurbish runners	4 sets	\$ 5,000	\$ 20,000
Remove rusted rungs and install new steel ladder access	10 locations		\$ 5,000
Labour – skilled (1 team leader for 10 days)	10	\$ 30	\$ 300
Labour – unskilled (5 operatives for up to 10 days each)	46.5	\$ 15	\$ 700
		<b>Total</b>	<b>\$ 26,500</b>

*Topographic Survey, Boreholes and infilling of low points in the flood embankment*

Description	Quantity	Unit Price	Cost
Topographic survey along crest of embankment, 5 km – (2 x skilled surveyor for 160 man hours each)	320	\$ 25	\$ 8,000
Geotechnical survey – 10m deep boreholes at 12 locations along the embankment to test ground conditions, including field engineer	120m	\$ 120	\$ 14,400
Ground investigation – analysis of samples from boreholes			\$ 7,200
Fill material to repair low points in the embankment	6,000m <sup>3</sup>	\$ 32	\$ 192,000
Labour – skilled (1 team leader for 120 days)	120	\$ 30	\$ 3,600

Labour – unskilled (8 labourers for 120 man hours each)	960	\$ 15	\$ 14,400
		<b>Total</b>	<b>\$ 239,600</b>
		<b>Grand Total</b>	<b>\$266,100</b>

## DATA COLLECTION

### *Inputs*

This study has been informed by data provided by the Ministry of the Environment, Preah Sihanouk Provincial Department of Water Resources and Meteorology, Preah Sihanouk Provincial Department of the Environment and the leaders of Boeng Taprom, Ou Oknha Heng, Prey Nob, Ou Crou and Veal Rinh Communes. Costings data has been provided with reference to various online resources including the Ministry of Public Works and Transport contract for the upgrading of National Road no 3 (dated 2012), adjusted for inflation. Mapping has used Google Earth satellite imagery and openly available GIS data including geology, land use and watercourses.

### **Consultations**

Consultation has been carried out with the national Ministry of the Environment, Preah Sihanouk Provincial Department of Water Resources and Meteorology, Preah Sihanouk Provincial Department of the Environment and the leaders of Boeng Taprom, Ou Oknha Heng, Prey Nob, Ou Chrou and Veal Rinh Communes.

For further information on the consultations undertaken in the formulation of the proposal, please refer to [Part II, Section H](#).

### **Site Records**

A site visit took place, where several of the sluice gates were inspected and the entire embankment was traversed by vehicle. There are areas of informal settlement buildings along the sides of the embankment, mostly on the seaward (mangrove) side, although there were several instances of buildings on the opposite side of the flood drainage canal, accessed via boat or makeshift bridges. If the embankment does require significant raising in future it is likely the bulk of the work will need to be done on the mangrove side in order to retain maximum flow capacity in the drainage canal, although we were advised that the canal is very shallow and it might be possible to increase capacity by deepening the channel if needed.

The sluice gate structures are all of approximately the same age and the same design. The rusted-through rungs were only observed on one gate but not all the gates were inspected in detail. Consultation with the Department of Water Resources and Meteorology indicated this issue applied to a further 9 gates, so funding has been requested to replace 10 ladders.

## IMPLEMENTATION

### *Design*

The design comprises five elements, grouped into two sub-headings. These are:

#### Repair of gates

- **Repair of the existing sluice gates.** Works to involve placing stop boards in the slots provided (Photo 1 in the Photos section below) to allow safe access and prevent water flow through while the gates are dismantled. The actions are then as follows:
  - a. Remove existing gates and either refurbish or replace the gates with new steelwork to the same design.
  - b. Refurbish the gate mechanism and the vertical runners.
  - c. Reassemble the gates.
- **Replace ladder.** Activities required:
  - d. Measure the height of the ladder required.
  - e. Cut away the existing steel rungs which are corroding (Photo 2 in the Photos section below).
  - f. Install new off-the-shelf stainless steel ladder of suitable length with a minimum of three brackets pre-welded to it (top, middle and bottom) and secure this into the concrete uprights using resin anchor bolts at a minimum of six locations (either side of ladder at top, centre and bottom, two bolts to each bracket).

#### Embankment Repair

- **Undertake topographic survey.** This should be carried out along the centre of the flood embankment along the entire 34.5km length.
- **Geotechnical survey.** Boreholes should be driven to 10m depth (or first refusal) at approximately 500m intervals along the section of the embankment marked in the map above as 'Area of Primary Concern', and should be located as close to existing sluice gates where an open channel through the mangrove exists as possible. This is because these areas are likely to be where historic deeper channels existed and so the ground may be less stable here.
- **Infill low points in embankment.** The topographic survey is necessary to identify the lowest points where overtopping is occurring. Once the survey has identified these points, bring in hardcore as necessary to raise the embankment structure. Mix in clay with the hardcore to improve the cohesion of the structure. It is anticipated that up to 0.5m depth of fill will be required in some locations. Along with the topographic survey results liaise with the Preah Sihanouk Department of Water Resources and Meteorology to ensure that all areas of overtopping are addressed. There is a possibility that areas close to open channels through the mangrove may be subject to higher incidences of overtopping as there is more risk of wave run-up and 'funneling' of water through the open channels than where mangrove provides further protection. The estimate assumes sufficient material to raise a 3km length of embankment 4m wide by 0.5m high.

The Report of Shoreline Assessment (2014) carried out for the Cambodia Ministry of the Environment suggests that maximum sea water level is expected to rise by 0.8m in the Prey Nob area by 2100. Given that the embankment is already overtopping in places to 0.5m, it will therefore have to be raised by a minimum of 1.3m to provide protection against frequent flood events up to 2100. This is not possible within the budget of the existing project, but in undertaking the topographic survey we will have identified the areas most in need of raising so this work can also be targeted more efficiently in future projects.

### ***Community Engagement***

The affected communities have been consulted on several occasions and we have additionally consulted with all the communes in Prey Nob district. The works required have been proposed by the communities themselves and there are no indications that the works would adversely impact anyone. The works should proceed with the full engagement of the community, using local labour and materials where possible, and minimising disruption to the adjacent farming and fishing communities.

For further information on the consultative process, please see [Part II, Section H](#) of the proposal.

### ***Construction***

The access road along the embankment is a single-track road with very few passing places. Any construction machinery required should be kept to small sized vehicles where possible and care should be taken to avoid the machinery causing damage to the embankment.

### ***Contractor Requirements***

The full topographic survey must be taken along the line of the embankment before any raising works are commenced, to ensure the repairs are correctly targeted to the lowest-lying areas. The borehole data will inform areas of deeper mud channels which could potentially sink more readily. If there is evidence of excessive settlement in these areas it is recommended that the embankment in these areas is raised by 0.5m above the neighbouring sections to provide for future settlement in the same area.

Upon completion of construction the crest level should be resurveyed throughout to ensure a consistent flood defence level.

### ***Key Risks & Safeguarding Issues***

#### **§ Environmental**

The works will require heavy components and machinery to be brought to site, and the existing road access along the top of the embankment is both narrow and unsurfaced. Care should be taken to avoid damage to the embankment and sluice gate structures from any machinery or vehicles, including the risk of vehicles and machinery falling off the embankment into the water.

The works will require some import of fill material to raise the embankment at identified low points. All material brought to site should be screened to ensure that no invasive species are imported accidentally.

#### **§ Social Safeguards**

There is a risk of conflict between the workforce employed on the construction and the local community. Care should be taken to minimise this risk. The community have been proactive in requesting the work to be done and where possible a local workforce should be employed. In the longer term, when the embankment requires more significant work to raise and widen its footprint this may impact the informal settlement communities on the seaward side. However, work under this investment should not cause this problem.

§ Gender/Youth (if applicable)

No safeguarding issues identified

For more information about the project's approach to environmental and social safeguards, please see [Part II, Section K](#).

## TECHNICAL DRAWINGS

For gate repairs please refer to existing design drawings for the sluice gate fittings and sizes.

The ladder should be a standard commercially available ladder of the correct size. Refer to the existing design drawings and measure the height required on the existing sluice gates.

## PHOTOS



**Figure 2** *“Photo 1 – Existing sluice gate. Note the stop board slots on the outside of the structure (arrowed). When boards are placed in these down to the cill this will enable the gates to be removed and refurbished while water is prevented from passing through the structure”*



**Figure 3** *“Photo 2 – note the steel rungs projecting from the near upright of the sluice gate structure. Some of these were observed to have rusted through. A new steel ladder should be provided fixed securely into the concrete uprights using brackets.”*





**Figure 4** *“Photo 3 – The existing shallow embankment showing the limited width for vehicle access and the drainage canal to the left (landward) side. Informal settlement building on the right-hand side.”*

**Table 1**

Environmental and Social Safeguard Principle	Risk Mitigation Actions Incorporated in The Design
<p><b>Compliance with the law</b>            projects/programmes supported by the Fund shall be in compliance with all applicable domestic and international law.</p>	<p>There are no anticipated legal issues</p>
<p><b>Access and Equity</b>            Projects/programmes supported by the Fund shall provide fair and equitable access to benefits in a manner that is inclusive and does not impede access to basic health services, clean water and sanitation, energy, education, housing, safe and decent working conditions, and land rights. Projects/programmes should not exacerbate existing inequities, particularly with respect to marginalized or vulnerable groups.</p>	<p>The investment will deliver reduced instances of salt water ingress into agricultural land, improving the likelihood of high crop yields and protecting the income and food supply for a significant number of people in the Prey Nob district. The agricultural and fishing communities living in the informal areas of settlement will experience improved access and improved food security.</p> <p>There will be some localised short-term disruption to traffic along the road accessing the informal settlements while work is taking place on the embankment.</p> <p>The investment will not discriminate in the services it provides to the target beneficiaries.</p>
<p><b>Marginalised and Vulnerable Groups</b>            Projects/programmes supported by the Fund shall avoid imposing any disproportionate adverse impacts on marginalized and vulnerable groups including children, women and girls, the elderly, indigenous people, tribal groups, displaced people, refugees, people living with disabilities, and people living with HIV/AIDS. In screening any proposed project/programme, the implementing entities shall assess and consider particular impacts on marginalized and vulnerable groups.</p>	<p>There are no anticipated issues regarding marginalised groups. There is some old data to suggest that small number of undocumented ethnic Vietnamese live in Prey Nob District but this was cross-checked with the elected Commune Council representatives and provincial level officials, who both assert that all undocumented ethnic Vietnamese have now been formalized and given Cambodian identity papers.</p>

<p><b>Human Rights</b> Projects/programmes supported by the Fund shall respect and where applicable promote international human rights.</p>	<p>There are no anticipated issues regarding human rights.</p>
<p><b>Gender Equity and Women's Empowerment</b> Projects/programmes supported by the Fund shall be designed and implemented in such a way that both women and men 1) have equal opportunities to participate as per the Fund gender policy; 2) receive comparable social and economic benefits; and 3) do not suffer disproportionate adverse effects during the development process.</p>	<p>In the poor communities affected by the proposal it was observed that women tend to take more of a household and community management role and therefore they are likely to benefit further from the community's improved crop yield, as they will be likely to take on the role of selling surplus crops. The men will benefit from improved yields from their labours. If the road overtops less frequently there will also be improved access to the market.</p>
<p><b>Core Labour Rights</b> Projects/programmes supported by the Fund shall meet the core labour standards as identified by the International Labour Organization.</p>	<p>There are no anticipated issues regarding core labour rights.</p>
<p><b>Indigenous People</b> The Fund shall not support projects/programmes that are inconsistent with the rights and responsibilities set forth in the UN Declaration on the Rights of Indigenous Peoples and other applicable international instruments relating to indigenous peoples.</p>	<p>There are no indigenous people among the investment's beneficiaries.</p>
<p><b>Involuntary Resettlement</b> Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids or minimizes the need for involuntary resettlement. When limited involuntary resettlement is unavoidable, due process should be observed so that displaced persons shall be informed of their rights, consulted on their options, and offered technically, economically, and socially feasible resettlement alternatives or fair and adequate compensation.</p>	<p>There is no resettlement required as a result of this investment.</p>

**Protection of Natural Habitat**

The Fund shall not support projects/programmes that would involve unjustified conversion or degradation of critical natural habitats, including those that are (a) legally protected; (b) officially proposed for protection; (c) recognized by authoritative sources for their high conservation value, including as critical habitat; or (d) recognized as protected by traditional or indigenous local communities.

The investment will help to maintain the boundary between salt water mangrove and cultivated paddy fields. As such it will help to prevent further erosion of the mangrove forest, by maintaining a clear delineation between the mangrove and cultivated land. There are areas of mangrove to seaward of the existing flood defence embankment that appear to have been previously cleared for cultivation but are now returning to nature. A separate investment will address re-planting these areas.

**Conservation of Biological Diversity**

Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids any significant or unjustified reduction or loss of biological diversity or the introduction of known invasive species.

Material imported to repair and consolidate the embankment should be environmentally screened to ensure that there are no invasive species brought to site.

**Climate Change**

Projects/programmes supported by the Fund shall not result in any significant or unjustified increase in greenhouse gas emissions or other drivers of climate change.

This investment will help to offset the effects of climate change for the poor local communities. There will be necessary but controlled CO2 emissions associated with the construction period only.

**Pollution Prevention and Resource Efficiency**

Projects/programmes supported by the Fund shall be designed and implemented in a way that meets applicable international standards for maximizing energy efficiency and minimizing material resource use, the production of wastes, and the release of pollutants.

Environmental safeguards should be applied during the construction works to ensure no cement or oils are allowed into the environment. The works will reduce the instances of pollution by improving performance of the existing embankment and water gates to better control flood flows.

**Public Health**

Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids potentially significant negative impacts on public health.

This investment should benefit public health by improving crop production. There are no anticipated negative effects.

***Physical and Cultural Heritage***

Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids the alteration, damage, or removal of any physical cultural resources, cultural sites, and sites with unique natural values recognized as such at the community, national or international level. Projects/programmes should also not permanently interfere with existing access and use of such physical and cultural resources.

There are no anticipated issues regarding physical and cultural heritage.

***Land and Soil Conservation***

Projects/programmes supported by the Fund shall be designed and implemented in a way that promotes soil conservation and avoids degradation or conversion of productive lands or land that provides valuable ecosystem services.

This investment should reduce the instances of salinisation and soil degradation by preventing upstream salt water ingress. This will improve the quality of the agricultural soil.



## 3.7 STORM WATER DRAINAGE SYSTEM DESIGN AND ROAD SIDE IMPROVEMENTS IN VEAL RENH MARKET AREA PREY NOB DISTRICT

*Investment 3.7*

### INTRODUCTION

The Veal Rinh market area and its surroundings consist of about 18 hectares located between the railway and National Road 4 Veal Rnh Commune, Prey Nob District. The area suffers from storm water flooding in the rainy season. The stretch of land between the road and the market area has the lowest elevation level. The current drainage system is poorly maintained and is too small to deal with the increasingly intense rainfall events that are likely to occur as a result of climate change. Therefore, floods occur inside and in front of the market in every time it rains.



### *Problem statement*

- The current storm water drainage system is too small for the market area's surroundings, causing flooding and long-term damage to infrastructure in the area. Based on the climate change assessment in Cambodia, the prediction is that the total annual rainfall will drop until 2030 and afterwards will increase again. There will be a shorter and more intense rainfall events occurring causing severe problems arising from the design of the current drainage system. To cope with the increased amount of high intensity precipitation in a shorter period, the drainage system around the market requires a new design.
- The poor solid waste management system in the market area and its surroundings, causes clogging of the drainage system. The drainage system around the market area is an open channel, it is easy for the people to throw garbage in to the channel. The existing drainage system is fully clogged with solid waste. This problem can further cause the stagnant water which can create the conditions for breeding bacteria, viruses or other micro-organisms. This can then lead to public health problems.

Resilience to natural hazards refers to the ability to protect lives, livelihoods and infrastructure from destruction and damage, and to the capability to restore areas after natural hazard has occurred. This investment seeks to improve the resilience of the affected communes to the vulnerability of increasingly intense rainfall events through the provision of:

- Improve storm water drainage system;
- Improved road layout and profile.
- Waste management education (provided under activities in Output 1.1, which are designed to support this activity)

## Location

The market area is located on National Road 4, close to the junction of National Roads 3&4 on the Sihanoukville side. This makes the area the entrance to Preah Sihanouk. Therefore, the area is suited as an example space for resilient living and integrated urban water management.

The problem location is in an open area between the main road and the market as shown in figure 1, this location has the lowest elevation levels. The precipitation in the market area and surroundings accumulates in the market area and is discharged by the open channel drainage and overland run-off. In the opposite site of the market, there is no drainage system. Rainwater runoff flows on the surface to the discharging points.



**Figure 1** “Flooding area at Veal Rinh Market”



## *Beneficiaries*

The beneficiaries of this investment range from people who living in the area to the people who passing through the road in a safer manner than before. The benefits can be addressed in to different categories of beneficiaries:

- Local residents
- District population
- Traffic in and out of Prey Nob District
- Economy

Approximately 4,500 people depend on the market for their livelihood. These people are the direct beneficiaries of the investment. The area surrounding the market has 1,976 households, with a total population of 10,717. Many of these people also sell at the market (and all of them buy from it), so they are indirect beneficiaries (if not included in the 4500 sellers). Besides this group the Prey Nob district accounts as beneficiaries as well since this is the districts main shopping area. The total population of Prey Nob will be benefitting the improvement is 100,387 (in 2017). The market area itself has total 4500 sellers, whose daily income relies on the access to the market area. When flooded these 4500 sellers cannot make an income on these days. Given that the market area roughly floods 30 days a year. With a conservative estimate of US\$10 income per shop per day, gives an approximate yearly loss of US\$1,350,000 per year due to flooding.

Cambodia is known for high casualties in traffic with figures up to 15.1 fatalities in each 10,000 registered vehicles in 2008 (ADB, infrastructure project). The construction of a central median in the road will prevent head-to-head crashes and guides the crossing traffic to safe zones (road safety toolkit). The limitation of crossing points will reduce congestion of traffic, which will benefit the wide range transport traffic, from Sihanoukville harbour to Phnom Penh and vice versa.

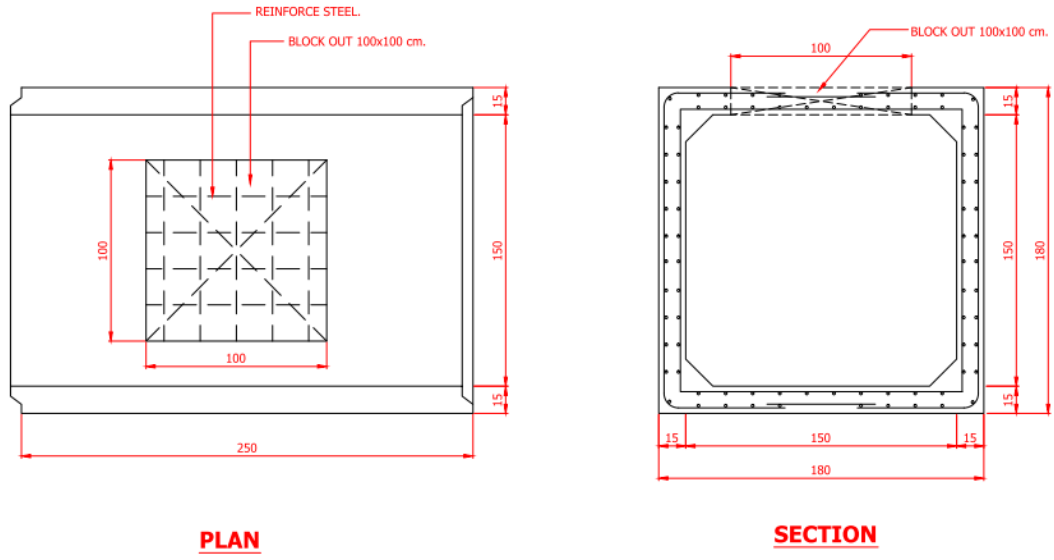
The regeneration of the road layout will increase the liveability of the area in total, creating shade and preventing flooding are essential focus points in the design for this investment. Rainwater harvesting can contribute the water scarcity solutions and greenery will reduce the dust and dirt in the area.

## BUDGET

### *Market area rehabilitation*

The cost for the improvement of the market area

Description	Quantity	Unit Price	Cost
Culvert 1500 x 1500 mm	1060 m	200\$/m	212,000
Traffic culvert 1500 x 1500 mm	100 m	2,500\$/m	250,000
Labour	375 days	\$15 per day	5,625
Labour skilled	125 days	\$30 per day	3,750
Connection with existing drainage system of surrounding	20 points	250\$/point	5,000
Trees	244 unit	20\$/unit	4,880
Excavation	1360 m	2.5\$/m	7,650
Lighting (Existing)			
Asphalt	2160 m <sup>2</sup>	75\$/m <sup>2</sup>	150,000
Rainwater tank	100 unit	130\$/unit	13,000
Excavator	1000 hr	39\$/unit	39,000
Garbage trap	4 unit	3,000\$/unit	12,000
Eco-Treatment	2 unit	5,000\$/unit	10,000
		<b>TOTAL</b>	<b>\$712,905</b>



**Figure 2** "Plan and Section of Culvert"

## DATA COLLECTION

### *Inputs*

Storm water design and the planning on road layout were suggested during the visit to the Veal Renh market together with the commune chief and the owner of the market. The community cleans the drainage system every two weeks, to remove the solid waste (plastics) to prevent the system from clogging. While visiting the site, there was still a significant amount of solid waste present in the drainage system, severely reducing its functionality. Below a summary on the site visit.

- The existing system has a diameter of 300-500 mm which is too small to deal with the increasing of rainfall intensity due to climate change. There are 2 discharging points in the opposite site of the market. The crossing pipe is also small, creating a bottleneck.
- The market building is designed with rainwater drainage into the sewer.
- Due to the low elevation at the front of market, the rainfall runoff from the surrounding area flows directly to this area or via open channel drainage.
- The commune chief suggested to apply the rectangular culvert instead of a circular pipe. This culvert can be open and should be cleaned frequently.
- System clogging with solid waste is one of main problems.
- There is no rainwater harvesting facility, all rainfall drains directly to drainage system. To retain the rainwater by installation of rainwater tanks, can be used for cleaning the market hall.

### *Consultations*

The Veal Rinh market is owned by a private owner and is run cooperatively with the local government. Consultation has been carried out with the market owner and commune chief for the implementation and planning.

### *Site Records*

- The owner and local government are aware of the small drainage system and want to re-design it to cope with climate change.
- The Veal Rinh market area is also aware of the problems caused by solid waste.
- At the discharging point opposite side of the market, there is a concern about land ownership issues. The discharging channel cannot be extended, only deepened. The system discharge directly to the rice field behind the housing area.
  - The runoff from the surrounding area drained direct or discharges in the open channel and connects to the drainage system at the corner of the market. The runoff from this surrounding area has in fact no separated drainage route except via the market system. Therefore, causing the crossing pipe, underneath the road, a system bottle neck. New drainage system has to be able to deal with the runoff from the whole area (the market and its surroundings).

- In the market, there is no rainwater harvesting facility, all rainwater drains directly to the system.
- The road width is approximately 20 meters. The house to house cross section is between 45 – 50 meters. Both side of the road has low level, so that water can easily flood.
- There is no proper solid waste management system.



*Figure 3 “Site Investigation”*

## IMPLEMENTATION

### *Design*

The drainage design concern about the climate change, the increasing of rainfall intensity is taken into account. The catchment area is extended to covered whole area.

### *Inputs*

- Catchment area: 187,905 m<sup>2</sup> (include market area and residential area both side of the road).
- Rainfall intensity based on climate adaptation: 200 l/s.ha
- This refers to the measurement record as following;
- Maximum rainfall per month = 1,319.7 mm = 1.3197 m = 0.043 m/day
- Assume rain fell only 15% of the time, in intense bursts rather than continuously. this gives a rainfall rate of: 0.043 m/day divided by 15% = 0.284 m/day = 11.83 mm/hr.
- For the drainage design which has to deal with short peak intensity, assume rainfall burst (peak) in 10 minutes = 11.83 mm/hr x 60/10 = 70.98 mm/hr or circa 197.33 l/s.ha
- Design concept is 2 main drainage systems along the road no.4 with 2 discharging points at the rice field side with eco-treatment.
- Slope 5 permille (5:1000).

**Figure 4** “Design catchment area”





**Figure 5** “Concept design of drainage system”

The maximum flow from rainfall runoff is:  $200 \text{ l/s} \cdot \text{ha} \times 187,905 \text{ m}^2 / 10,000 \text{ m}^2 / 2 = 1,879.05 \text{ l/s}$

From the input, 4 culvert profiles been analysed. Based on the calculation details below, the most suitable culvert size at laying 5 permille is 1.5 m X 1.5 m.

It is suggested to have a garbage trap at the location of crossing road culvert for both sides. This trap will help community to collect solid waste before discharging and to prevent the clogging problem. At both discharging points is suggested to install a small eco-treatment facility like helophyte filter or wetland to treat the rainwater before discharge to the rice field.

The concept sketch design for the road no.4 in front of the Veal Renh market show in figure 8.

For rainwater harvesting, the investment will have a small water tank spreading over entirety of the market area, especially the vegetable and meat zones. The harvested rainwater can be used for cleaning the wet area. The water tank will be connected to the existing roof drain.

The drainage system of the surrounding/residential area is not included in this project as this would be prohibitively expensive and highly complex from an environmental and social safeguard point of view due to the ownership of the land and gaining the necessary consent from the communities.



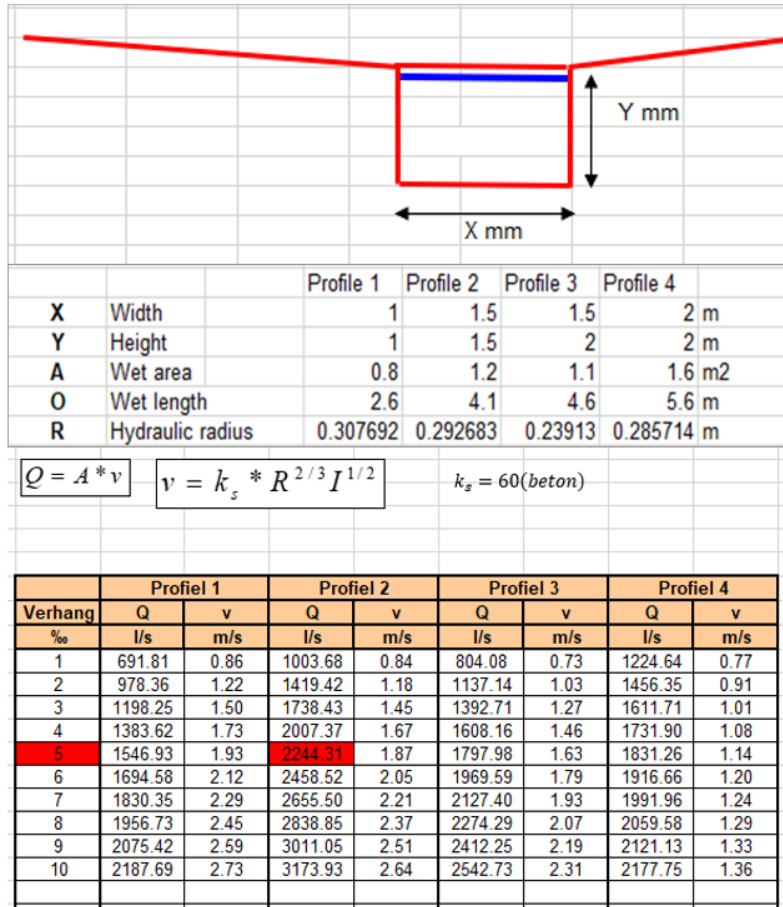
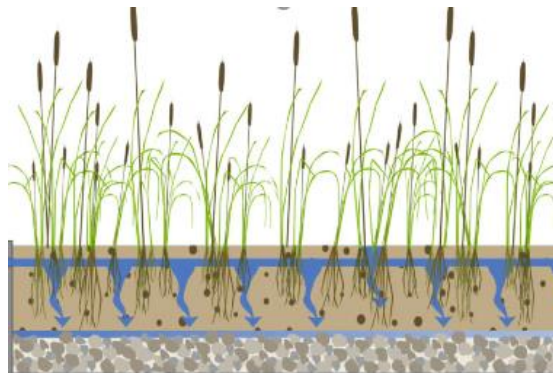
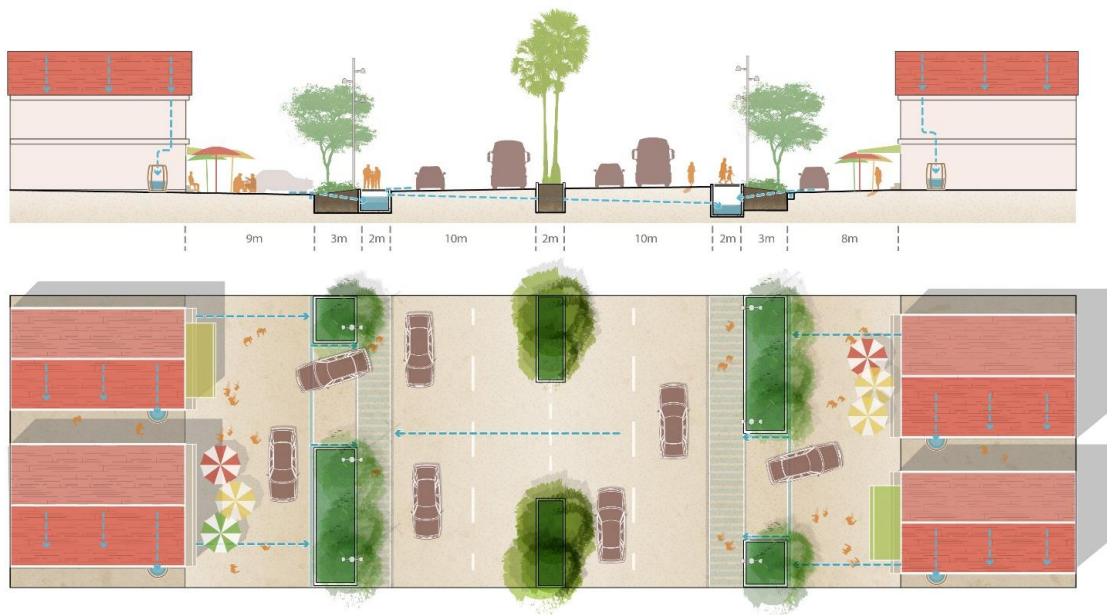


Figure 6 "Calculation"



**Figure 7** “Eco treatment/Helophyte filter”

**Figure 8** “Concept street profile”



### *Community Engagement*

The community is currently engaged by the removal of the solid waste from the drainage system twice weekly.

The project should be proceeding with the full engagement of the community for the solid waste management. This is programmed into the project under the activities proposed under Output 1.1.

Capacity building on climate adaptation is also suggested, the market and the community around have to understand the changing of rainfall pattern and how to maintain their drainage system to have a best drainage efficiency. Training for communities on basic maintenance and use of the system is provided by the project under Output 1.3.

For further information about the consultative process undertaken in the formulation of this proposal, please see [Part II, Section H](#) of the proposal.

### *Construction*

Construction of the market area road side and the storm water drainage system are two separate investments. These two investments are good practice examples that can be replicated throughout the country. This concept design combines the urban landscape and water works to adapt to climate change and promote a better living environment for the community. A large number of markets are prone to flood events in Cambodia. With increasing urbanisation and expanding paved surfaces, storm water floods likely to become more frequent and severe in the near future.

For the construction, it will require a local contractor who can do excavation works and laying of new drainage system. The culvert can be fabricated at factory and transport to the site for installation.

### *Contractor Requirements*

Material:

- A concern is the quality of the culverts used for the drainage system. These culverts need to be easily maintainable. Therefore, the top should be possible to lift up.

Contractor:

- The contractor must have enough heavy machinery capacity for excavation works especially be able to do speed works crossing road no.4. The crossing must be done in short time, to minimize effect to the traffic. Good planning is essential.
- Contractor must have ability to do a detail design for the system.

### *Key Risks & Safeguarding Issues*

§ Environmental (if applicable)

As in the existing system, the investment will have a discharging point in the rice field. The drainage system could bring the pollution to that point. The investment on two small Eco treatment is designed to alleviate this risk by treating polluted rainwater before discharge to a level where the water is suitable for animals to drink.

§ Social Safeguards (if applicable)

During the construction, temporary disruption could lead to a social conflict especially the access for the seller in the market and housing around. Care should be taken to ensure that there is a good planning for alternative access route. Consultation with sellers in the market and local residents will take place throughout the construction.

Also, the system requires a crossing on main road no.4. Care should be taken to ensure that there is minimal effect on the transport.

For the construction of drainage discharging, it might lead to temporary disturbance of land owner. It will be requiring the cooperation of land owner along the route. Consultation will take place throughout, with consent in place in advance.

§ Gender/Youth (if applicable)

No safeguarding issues identified

**Table 1**

Environmental And Social Safeguard Principle	Risk Mitigation Actions Incorporated In The Design
<p><b><i>Compliance with the law</i></b>            projects/programmes supported by the Fund shall be in compliance with all applicable domestic and international law.</p>	<p>The project requires a good cooperative with land owner, market sellers, local people in surrounding and local government and transport system that might affect. A good execution planning is required and must be informed to the involved stakeholders before proceed.</p> <p>However, no legal issues are anticipated</p>
<p><b><i>Access and Equity</i></b>            Projects/programmes supported by the Fund shall provide fair and equitable access to benefits in a manner that is inclusive and does not impede access to basic health services, clean water and sanitation, energy, education, housing, safe and decent working conditions, and land rights. Projects/programmes should not exacerbate existing inequities, particularly with respect to marginalized or vulnerable groups.</p>	<p>The new drainage system and landscape works along the road will improve safety from flooding to all stakeholders in this area. All stakeholders will get benefit from this project.</p> <p>Every housing in this area can connect their rainwater pipe direct or indirect to the system.</p> <p>Proactive measures will be taken to ensure that people (and especially sellers, who are primarily women) can still access the market while the works are ongoing.</p>
<p><b><i>Marginalised and Vulnerable Groups</i></b>            Projects/programmes supported by the Fund shall avoid imposing any disproportionate adverse impacts on marginalized and vulnerable groups including children, women and girls, the elderly, indigenous people, tribal groups, displaced people, refugees, people living with disabilities, and people living with HIV/AIDS. In screening any proposed project/programme, the implementing entities shall assess and consider particular impacts on marginalized and vulnerable groups.</p>	<p>There are no anticipated issues regarding marginalized groups.</p>
<p><b><i>Human Rights</i></b>            Projects/programmes supported by the Fund shall respect and where applicable promote international human rights.</p>	<p>There are no anticipated issues regarding human rights.</p>

<p><b><i>Gender Equity and Women's Empowerment</i></b>  Projects/programmes supported by the Fund shall be designed and implemented in such a way that both women and men 1) have equal opportunities to participate as per the Fund gender policy; 2) receive comparable social and economic benefits; and 3) do not suffer disproportionate adverse effects during the development process.</p>	<p>There are no anticipated issues regarding gender equity.</p> <p>The project is primarily designed to benefit women. It is estimated that 90% of the sellers in the market are women, so the incomes that will be safeguarded and increased as a result of the project will primarily be women's</p>
<p><b><i>Core Labour Rights</i></b>  Projects/programmes supported by the Fund shall meet the core labour standards as identified by the International Labour Organization.</p>	<p>Unskilled labour will be provided by the community. Safety issues are critical as labourers will be working in the vicinity of National Road 4, the main highway between Sihanoukville and Phnom Penh. Safety training and appropriate equipment will be given.</p> <p>For further information about the general provisions for the safety of workers, and the safeguarding of their labour rights, please see <a href="#">Part II, Section K</a> of the proposal.</p>
<p><b><i>Indigenous People</i></b>  The Fund shall not support projects/programmes that are inconsistent with the rights and responsibilities set forth in the UN Declaration on the Rights of Indigenous Peoples and other applicable international instruments relating to indigenous peoples.</p>	<p>There are no indigenous people in the project's target area</p>

<p><b><i>Involuntary Resettlement</i></b>  Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids or minimizes the need for involuntary resettlement. When limited involuntary resettlement is unavoidable, due process should be observed so that displaced persons shall be informed of their rights, consulted on their options, and offered technically, economically, and socially feasible resettlement alternatives or fair and adequate compensation.</p>	<p>There is no resettlement required.</p>
<p><b><i>Protection of Natural Habitat</i></b>  The Fund shall not support projects/programmes that would involve unjustified conversion or degradation of critical natural habitats, including those that are (a) legally protected; (b) officially proposed for protection; (c) recognized by authoritative sources for their high conservation value, including as critical habitat; or (d) recognized as protected by traditional or indigenous local communities.</p>	<p>There are no sensitive natural habitats in the area, which is heavily urbanized.</p>
<p><b><i>Conservation of Biological Diversity</i></b>  Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids any significant or unjustified reduction or loss of biological diversity or the introduction of known invasive species.</p>	<p>There is no risk on biological diversity. See also the Protection of Natural Habitats, above.</p>
<p><b><i>Climate Change</i></b>  Projects/programmes supported by the Fund shall not result in any significant or unjustified increase in greenhouse gas emissions or other drivers of climate change.</p>	<p>The project will help the local to better understand and to deal with effects of climate change. The construction will not generate a significant amount of greenhouse gas. The benefit of a better drainage system and flood prevention and adaptation to climate change substantially outweighs and negligible emissions caused by the construction works.</p>

<p><b><i>Pollution Prevention and Resource Efficiency</i></b>  Projects/programmes supported by the Fund shall be designed and implemented in a way that meets applicable international standards for maximizing energy efficiency and minimizing material resource use, the production of wastes, and the release of pollutants.</p>	<p>The waste and pollution at discharging point is taking account into the design. The eco-treatment system has been incorporated into the design to eliminate the possibility of polluted wastewater (which is the present situation), by using nature-based solutions to treat waste water to a level where it is safe for animals to drink.</p>
<p><b><i>Public Health</i></b>  Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids potentially significant negative impacts on public health.</p>	<p>The better drainage system will reduce the stagnant water. Disease from virus, bacteria and microorganism can be decreased as a result.</p>
<p><b><i>Physical and Cultural Heritage</i></b>  Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids the alteration, damage, or removal of any physical cultural resources, cultural sites, and sites with unique natural values recognized as such at the community, national or international level. Projects/programmes should also not permanently interfere with existing access and use of such physical and cultural resources.</p>	<p>The project will promote the better landscape design for living. There will be no effect to physical and culture heritage.</p>
<p><b><i>Land and Soil Conservation</i></b>  <i>Projects/programmes supported by the Fund shall be designed and implemented in a way that promotes soil conservation and avoids degradation or conversion of productive lands or land that provides valuable ecosystem services.</i></p>	<p>There are no anticipated issues regarding land and soil conservation.</p>



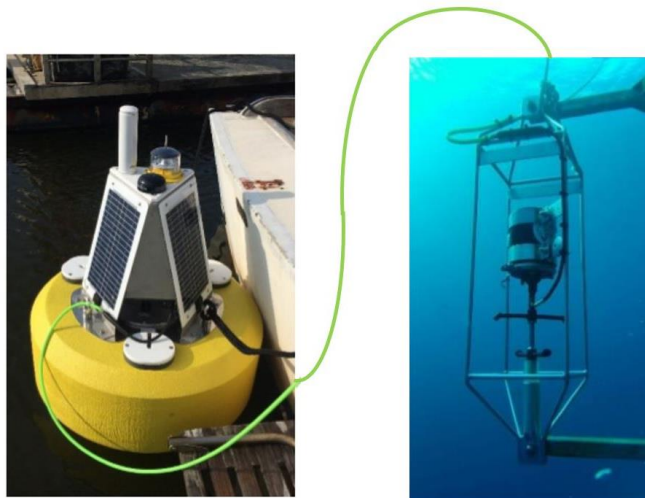
### 3.8 TIDE GAUGE IN PREY NOB DISTRICT

Investment sheet 3.8

#### INTRODUCTION

*Problem statement*

The communities of Prey Nob district lying on the coastal plain either side of the Kampong Smach estuary are increasingly experiencing flooding from the sea, and a sea defence embankment built in the period 1997-2001 is now reported as being overtopped every 2-3 years. There is a tide gauge within Preah Sihanouk province at Sihanoukville port, but this is on the opposite side of the Sihanoukville peninsula and does not necessarily record data reflecting the unusual tidal circumstances at the Kampong Smach, which has a shallow offshore shelf, a funnelling estuary mouth and the effects of several offshore islands affecting the tidal regime.



Deliverables	Providing and installing a tide gauge and providing training in its operation and maintenance
Beneficiaries	Approx 30,000
Budget	US\$ 52,380
Location	Provides improved flood warning to all low-lying areas of Prey Nob district

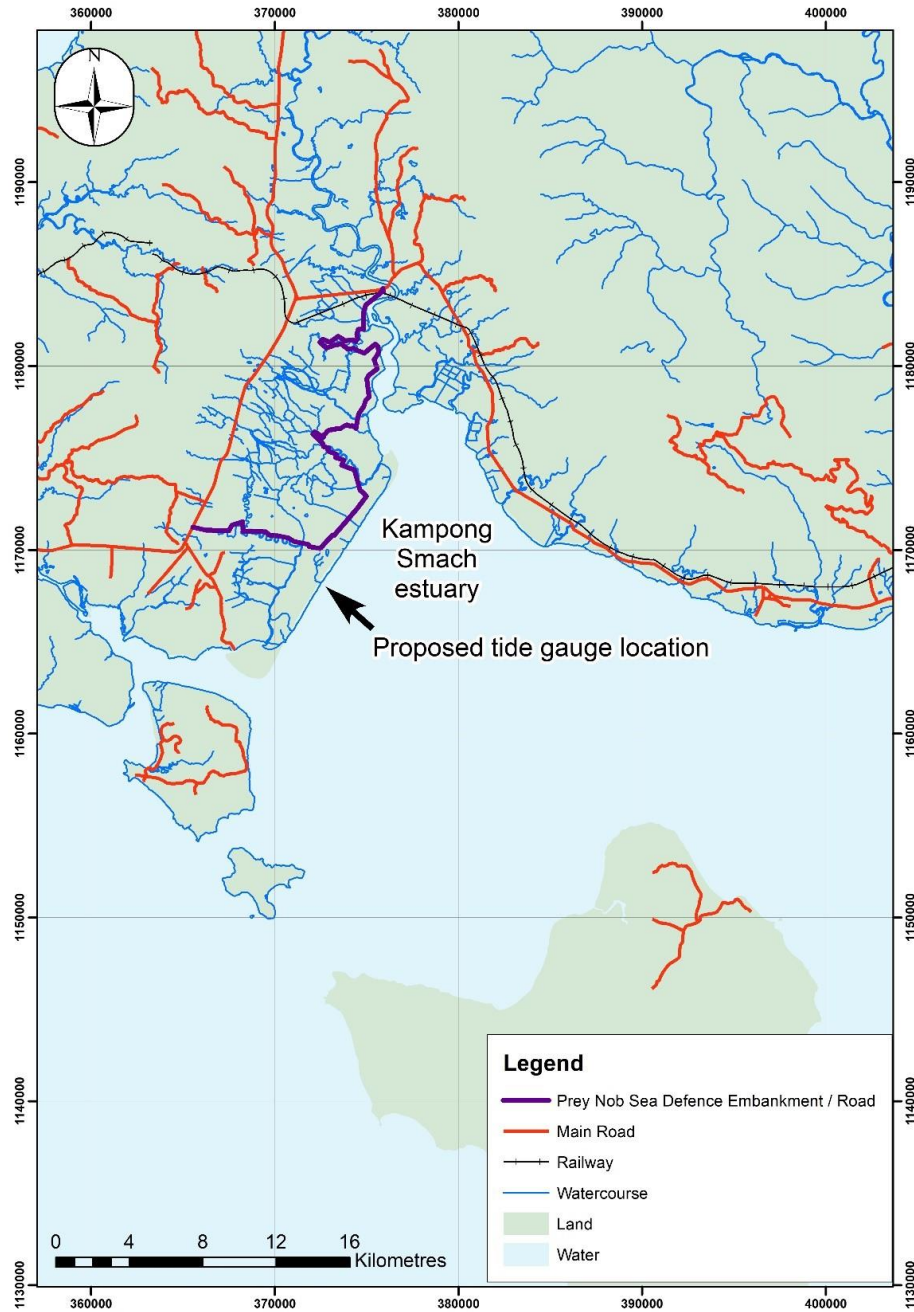
The Preah Sihanouk Provincial Department of Meteorology and Water Resources has requested installation of a tide gauge at the outer edge of the mangrove forest at Ou Oknha Heng, to provide accurate data on sea level rise in this location and thereby improve flood warning capability for the low-lying communities of Prey Nob district on both sides of the Kampong Smach.

### **Location**

The proposed location is 700m from the Prey Nob sea defence embankment at the outer edge of the mangrove, on the edge of open sea water. At high tide the depth to the muddy sea bed is only 1.7m, and the mangroves reach approx. 15m height. The location is shown on the map below. This location has been selected by the Preah Sihanouk Department of Water Resources and Meteorology as a relatively accessible location within the bay beyond the Kampong Smach estuary. The bay here is very shallow, reaching no more than 3m water depth at normal high tide over 1km beyond the mangrove according to openly available bathymetric mapping. A tide gauge at this location will be able to give a good representation of the tidal regime within the entire bay.

### ***Beneficiaries***

There are 55,776 people listed as resident within the affected communes of Prey Nob District and of those approx. 30,000 live or work close to sea level in the low-lying coastal areas. The entire area depends on food produced in the coastal strip. On increasing occasions in recent years homes and crops have been damaged by incidences of sea water overtopping existing defences and coming further inland, and the district has a growing population which is straining the existing resources.



**Figure 1** “Kampong Smach estuary, with proposed tide gauge location indicated with a black arrow.”

## BUDGET

### *Construction and installation of tide gauge*

- Assume exchange rate of us\$1.32 = GB£1.00, which is the approximate average over the period 01/04/2016 – 31/03/2018. Supplier's quote in GB£ is annexed to the end of this document – includes supply and installation. Shipping costs assumed based on commercial shipping charges.

There will also be ongoing running costs, including regular maintenance and a telemetry fee to the mobile phone network. It is assumed these will be paid by the Department of Water Resources and Meteorology once the installation is complete. The costing assumes installation by a trained specialist provided by the supplier.

Description	Quantity	Unit Price	Cost
Provision of wave and tide gauge for remote, shallow location – type 'FSI Remote Coastal Reporter'			\$23,250
Shipping, customs clearance, local shipping taxes, transshipment to shallow draught vessel for access to site and delivery			\$23,760
Installation of same			\$5,370
		<b>TOTAL</b>	<b>\$52,380</b>

## DATA COLLECTION

### *Inputs*

This study has been informed by bathymetric data collected during a site visit, publicly-available online maps showing nearshore bathymetry in the estuary area and a quote from a commercial supplier of wave and tide gauges. Mapping has used Google Earth satellite imagery and openly available GIS data including geology, land use and watercourses.

### *Consultations*

Consultation has been carried out with the national Ministry of the Environment, Preah Sihanouk Provincial Department of Water Resources and Meteorology, Preah Sihanouk Provincial Department of the Environment and the leaders of Boeng Taprom, Ou Oknha Heng, Prey Nob, Ou Crou and Veal Rinh Communes.

### *Site Records*

A site visit took place during approximately local normal high tide conditions, and a record was taken of the depth to bed at the location proposed for the gauge. This was 1.7m from the high tide water surface to the mud. It was observed that the area was sheltered on two sides by established mangrove forest at least 4m in height, open to the north-west to a shallow navigable channel between the mangroves approx 4m wide and open to the south-east to the sea. There is no mains electricity supply within 5 km of the site, so the gauge will have to work on solar / battery power. It was observed that the Smart mobile phone network provides coverage at the proposed deployment site to enable telemetry of the data.

The particular constraints of this site are that the water is shallow throughout the bay, but this is a location that is relatively easily accessed by small boat. With high tides only 3m deep well off shore, the bay is not capable of taking deep draught vessels. The risk of vandalism is considered unlikely and the risk of damage by boat impact should be minimised as the channel is generally only used by a small fishing community and the above-water equipment is finished in hi-visibility yellow paint. The gauge will be used to build up a dataset of tidal conditions in the bay to facilitate prediction of high tidal levels. The next nearest existing tide gauge is in Sihanoukville port, in deeper water 20km away on the other side of a peninsula.

## IMPLEMENTATION

### *Design*

The requirements and constraints of the site were provided to a commercial supplier of wave and tide gauges for their advice. They recommended the FSI Remote Coastal Recorder, which is an acoustic device fixed under the water but with a cable connection to a small buoy on which is mounted the solar panels and telemetry equipment. Their brochure is attached on the next page and their costing is annexed to the end of this investment sheet. Although this form of gauge is designed to operate in a range of water depths up to 25m, it can also function effectively in much shallower waters, whereas many other gauges cannot.

Installation costs by a specialist approved by the supplier is included in the supplier's costing. The equipment will be provided with an O&M Manual and we have included a sum for training of maintenance operatives – this includes translation of the O&M Manual into Khmer.



## FSI Remote Coastal Reporter

### *Remote Real-Time Reporting of Coastal Current, Wave, and Tide Data*



#### Flexible Installation Platforms

- Buoy or Fix-Mounted
- Harbors, Estuaries, other Remote Areas

Minimizes end-user cost by using standard low-cost digital cellular data plans

Long-term unattended deployments utilizing solar powered systems

Data Transmission over standard Cellular Networks, or other optional communication systems

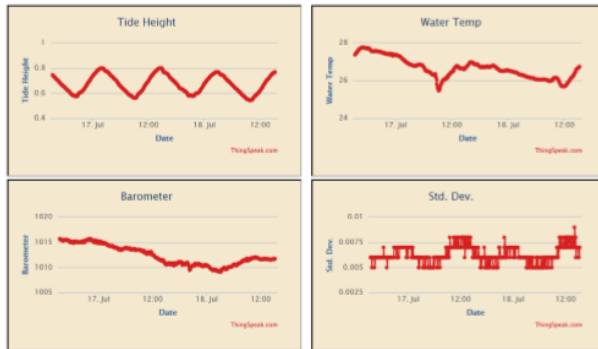
Near Real-Time Data displayed, hosted, & shared over the ThingSpeak™ IoT Analytics Platform Service



The **Falmouth Scientific Remote Coastal Reporter** is a turn-key system that provides transmission of real-time sensor data from remote areas to the Internet of Things (IoT) cloud for access by users around the world.

Standard and Custom Sensors can be incorporated onto flexible deployment configurations that can be located in remote areas such as estuaries, marshes, inlets, lakes, and harbors.

Data is reported back through a cellular communication system to be shared over the ThingSpeak™ IoT Analytics Platform.



Accommodates the  
**FSI PLUS Family** and  
 other types of Sensors

- **ACM-PLUS**
- **ACM-WAVE-PLUS**
- **WAVE-TIDE-PLUS**
- **Tide System**



Falmouth Scientific, Inc.  
[www.falmouth.com](http://www.falmouth.com)



## ***Community Engagement***

The community have been consulted on a number of occasions and we have additionally consulted with all the communes in Prey Nob district. There are no indications that the works would adversely impact anyone. The works should proceed with the full engagement of the community, using local labour and materials where possible (e.g. for the shallow draught vessel to deliver to site), and minimising disruption to the adjacent farming and fishing communities.

## ***Construction***

Access for installation will be from the water. It is assumed that the gauge and associated equipment will be transhipped at a local sea port (Sihanoukville) onto a shallow draught vessel which can then access the shallow waters where the gauge is proposed for deployment.

## ***Contractor Requirements***

installation should be carried out under the instructions of the approved supplier.

## ***Key Risks & Safeguarding Issues***

### **§ Environmental**

The works will require components and machinery to be brought to site. Existing road access along the top of the embankment is both narrow and unsurfaced, and the installation location is a further 700m beyond the end of the road access, in open water. Therefore it is proposed that installation takes place from a floating platform or shallow draught vessel, loaded at a suitable local port (Sihanoukville) and transhipped to site.

Care should be taken to minimise any damage to the adjacent area of mangrove from any floating plant or machinery.

### **§ Social Safeguards**

There are no anticipated social conflicts as a result of this installation. Care should be taken to ensure the gauge is not positioned so as to obstruct navigable access to the channel through the mangrove which could cause problems for the local fishing community.

### **§ Gender/Youth (if applicable)**

No safeguarding issues identified



## TECHNICAL DRAWINGS

To be provided by the manufacturer / supplier

## PHOTOS



**Figure 2** *“Proposed location for tide gauge at mouth of a narrow, shallow channel through the mangrove (indicated by arrow). Water access to here is only possible by a shallow draught vessel as the normal high tide level is less than 2m above bed.”*

**Table 1**

<b>Environmental and Social Safeguard Principle</b>	<b>Risk Mitigation Actions Incorporated in The Design</b>
<p><b><i>Compliance with the law</i></b>            Projects/programmes supported by the Fund shall be in compliance with all applicable domestic and international law.</p>	<p>There are no anticipated legal issues</p>
<p><b><i>Access and Equity</i></b>            Projects/programmes supported by the Fund shall provide fair and equitable access to benefits in a manner that is inclusive and does not impede access to basic health services, clean water and sanitation, energy, education, housing, safe and decent working conditions, and land rights. Projects/programmes should not exacerbate existing inequities, particularly with respect to marginalized or vulnerable groups.</p>	<p>This investment will deliver improved warning and understanding of high tides and enable better preparation for protection against sea water ingress into agricultural areas. This will help build local resilience to all the communities living in close proximity to the sea within Prey Nob district. It is generally the case that the poorest and most marginalized live in informal settlements on the edge of the mangrove and these communities stand the most to gain from improved flood warnings.</p>
<p><b><i>Marginalised and Vulnerable Groups</i></b>            Projects/programmes supported by the Fund shall avoid imposing any disproportionate adverse impacts on marginalized and vulnerable groups including children, women and girls, the elderly, indigenous people, tribal groups, displaced people, refugees, people living with disabilities, and people living with HIV/AIDS. In screening any proposed project/programme, the implementing entities shall assess and consider particular impacts on marginalized and vulnerable groups.</p>	<p>There are no anticipated issues regarding marginalised groups. There are reported to be a small number of ethnic Vietnamese living in the Prey Nob District, but the local population is inclusive and does not distinguish between indigenous and immigrant members.</p>
<p><b><i>Human Rights</i></b>            Projects/programmes supported by the Fund shall respect and where applicable promote international human rights.</p>	<p>There are no anticipated issues regarding human rights.</p>

<p><b>Gender Equity and Women’s Empowerment</b>  Projects/programmes supported by the Fund shall be designed and implemented in such a way that both women and men 1) have equal opportunities to participate as per the Fund gender policy; 2) receive comparable social and economic benefits; and 3) do not suffer disproportionate adverse effects during the development process.</p>	<p>There are no anticipated issues regarding gender equity.</p>
<p><b>Core Labour Rights</b>  Projects/programmes supported by the Fund shall meet the core labour standards as identified by the International Labour Organization.</p>	<p>There are no anticipated issues regarding core labour rights. Installation of the gauge will require input from outside specialists but local Department of Meteorology and Water Resources staff will be trained to maintain and operate the gauge.</p>
<p><b>Indigenous People</b>  The Fund shall not support projects/programmes that are inconsistent with the rights and responsibilities set forth in the UN Declaration on the Rights of Indigenous Peoples and other applicable international instruments relating to indigenous peoples.</p>	<p>The poor communities benefitted by the proposal appear to be entirely of an indigenous population. The community appears to be highly inclusive and does not distinguish between indigenous and immigrant members.</p>
<p><b>Involuntary Resettlement</b>  Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids or minimizes the need for involuntary resettlement. When limited involuntary resettlement is unavoidable, due process should be observed so that displaced persons shall be informed of their rights, consulted on their options, and offered technically, economically, and socially feasible resettlement alternatives or fair and adequate compensation.</p>	<p>There is no resettlement required as a result of this investment. By providing improved flood warning this investment does have a positive effect on the viability of the communities living along the sea defence embankment and reduces the need for resettlement.</p>

<p><b>Protection of Natural Habitat</b> The Fund shall not support projects/programmes that would involve unjustified conversion or degradation of critical natural habitats, including those that are (a) legally protected; (b) officially proposed for protection; (c) recognized by authoritative sources for their high conservation value, including as critical habitat; or (d) recognized as protected by traditional or indigenous local communities.</p>	<p>The installation will not affect the mangrove. There are no anticipated issues regarding any degradation of the natural habitat.</p>
<p><b>Conservation of Biological Diversity</b> Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids any significant or unjustified reduction or loss of biological diversity or the introduction of known invasive species.</p>	<p>There are no anticipated issues regarding any impact on biological diversity.</p>
<p><b>Climate Change</b> Projects/programmes supported by the Fund shall not result in any significant or unjustified increase in greenhouse gas emissions or other drivers of climate change.</p>	<p>This investment will help to better understand the local effects of climate change for the poor local communities, and enable more effective adaption. There will be necessary but controlled CO2 emissions associated with the construction period only.</p>
<p><b>Pollution Prevention and Resource Efficiency</b> Projects/programmes supported by the Fund shall be designed and implemented in a way that meets applicable international standards for maximizing energy efficiency and minimizing material resource use, the production of wastes, and the release of pollutants.</p>	<p>Environmental safeguards should be applied during the construction works to ensure no oils from the installation plant are allowed into the environment.</p>
<p><b>Public Health</b> Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids potentially significant negative impacts on public health.</p>	<p>This investment should benefit public health by improving the local flood warning capability, giving more time to evacuate or prepare for flooding if necessary. There are no anticipated negative effects.</p>

***Physical and Cultural Heritage***

Projects/programmes supported by the Fund shall be designed and implemented in a way that avoids the alteration, damage, or removal of any physical cultural resources, cultural sites, and sites with unique natural values recognized as such at the community, national or international level. Projects/programmes should also not permanently interfere with existing access and use of such physical and cultural resources.

There are no anticipated issues regarding physical and cultural heritage.

***Land and Soil Conservation***

Projects/programmes supported by the Fund shall be designed and implemented in a way that promotes soil conservation and avoids degradation or conversion of productive lands or land that provides valuable ecosystem services.

There are no anticipated issues regarding land and soil conservation.



*TIDE GAUGE IN PREY NOB DISTRICT*

## A. Annex 3 – Environmental and Social Management Plan

### 1. Introduction

This ESMP has been developed specific to the defined components of the project. It has been developed as a standalone document which can be amended and expanded where necessary through the project implementation phase to ensure all risks, impacts and required mitigation and monitoring elements are fully comprehensible to all parties.

The ESMP lists all potential risks identified and the preventive / mitigation measures proposed to reduce potentially adverse environmental and social impacts to acceptable levels. The plan also shows how these potential risks and mitigation measures will be further monitored, including responsibilities. Specifically, the ESMP:

- (i) Identifies and summarizes all anticipated adverse environmental and social risks and impacts in line with the Adaptation Fund’s ESP principles.
- (ii) Provides information about the significance of the risks of interventions.
- (iii) Describes mitigation measures, both from the perspective of mitigating risks at each activity and from the perspective of upholding all ESP principles.
- (iv) Refers to responsibilities and sections where responsibilities for further screening and monitoring is discussed.
- (v) Takes into account, and is consistent with, other mitigation plans required for the project in particular those that relate to national law.

This ESMP should be revised, and reissued, prior to commencement of any proposed activities or interventions in accordance with

### 2. Environmental and social risk assessment of activities and interventions (investments)

Environmental and social risk assessment was undertaken using the following formula and matrix for significance of risk:

Significance = likelihood x consequence severity

*Risk matrix:*

	Consequence				
		Negligible	Marginal	Critical	Catastrophic
Likelihood	Certain	High	High	Extreme	Extreme
	Likely	Moderate	High	High	Extreme
	Possible	Low	Moderate	High	Extreme
Likelihood	Unlikely	Low	Low	Moderate	Extreme
	Rare	Low	Low	Moderate	High

The table at the end of this section includes the assessment of significance of risk based on likelihood of the risk or impact occurring and consequence of it of its effect. The risk significance should be revisited, and assessment of impacts and mitigations updated where necessary, prior to commencement of activities and investments.

### **3. Additional Risk Mitigation**

Additional to the risk mitigation measures identified below, the following elements will be put in place to ensure the compliance with the ESP:

- (i) All MoUs and Agreements of Cooperation with the Executing Entity will include detailed reference to this ESMP and in particular the 15 ESP Principles.
- (ii) The ToR of Committees and Advisory Groups, project personnel and focal points will include detailed reference to this ESMP and in particular the 15 ESP Principles.
- (iii) All key Executing Entity Partners will receive training / capacity development to understand the 15 Principles, the ESMP and in particular their responsibilities. This will include members of the Project Management Committee, the Local Steering Committees and the Communities.
- (iv) A Monitoring and Evaluation Framework, including monitoring of risks and mitigation measures, will be developed by the project management team and presented for approval to the Project Management Committee.
- (v) The UN-Habitat Human rights officers and PAG will check project compliance with the AF ESP and the Environmental and Social Safeguard System of UN-Habitat during the project (besides the project manager).

### **4. Project Grievance mechanism**

UN-Habitat will implement a grievance mechanism in the target areas, which will allow an accessible, transparent, fair and effective means of communicating if there are any concerns regarding project design and implementation. Employees, and people affected by the project will be made aware of the grievance mechanism for any criticism or complaint of an activity.

This mechanism considers the special needs of different groups as well as gender considerations. A combination of mailboxes (at Commune level), confidential persons in the community and telephoning options offer an immediate way for employees and people affected by the project to express their concerns. The options will allow local languages and offer the opportunity for and people affected by the project to complain or provide suggestions on how to improve project design and implementation. The project will place equal weight on written and verbal reporting of grievances, recognizing that literacy rates are somewhat below 100% across the target area.

Project staff will be trained in procedures for receiving messages and on the reporting of any grievances. Community chiefs will also be briefed how to obtain feedback from community members on a regular basis. In addition, monitoring activities allow project participants to voice their opinions or complaints as they may see fit.

The address and e-mail address of the Adaptation Fund will also be made public (i.e. project website, Facebook and mailbox) for anyone to raise concerns regarding the project:

Adaptation Fund Board secretariat

Mail stop: MSN P-4-400



1818 H Street NW

Washington DC

## 5. Environmental and Social Baseline, Impact Assessment and Mitigation

To ensure proper management of environmental and social aspects of the project through development and implementation, the environmental and social setting of each of the project activities was addressed. For assessing risk and aligning mitigation, management and monitoring requirements, each Component and output was considered separately. Component 1 and 2 are relevant to the broader Kep and Preah Sihanouk provinces, so the environmental and social setting overarching is outlined.

For the investments under Component 3, the environmental and social setting is more specifically addressed where necessary to assist with adequate risk assessment and identification of potential impacts and required mitigation and monitoring.

To understand the broader context of the setting for the proposal relevant to Kep and Preah Sihanouk Provinces, please see Part 1 of the full proposal. For the geographic context, please see the respective maps for Kep Province and Prey Nob District.

This sections below cover the specific environmental and social aspects of each province, to enable assessment of risk and impacts, and to provide for more relevant mitigation, management and monitoring requirements.

### **Component 1 and 2 – Existing social and environmental context of Kep and Preah Sihanouk provinces**

Severe environmental degradation has taken place throughout the coastal area of Cambodia – especially in areas where there has been investment in infrastructure and tourism. Besides that, the often-informal nature of the target settlements creates environmental problems. Moreover, the combined effects of sea-level rise, coastal flooding, and on-shore development issues are causing coastal erosion.

Both Kep and Preah Sihanouk Provinces are experiencing coastal erosion and impacts of sea level rise, in combination with extensive issues with water resourcing and solid waste management.

The Ministry of Environment has specified the importance of forests in maintaining the country's ecosystems. In Preah Sihanouk, 26% of the land is categorized as protected forest area, in Kep 7%. However, forestry was drastically exploited in the last few decades due to illegal logging, encroachment, and economic land concessions. Deforestation is still happening in coastal areas, especially mangrove forests. Studies by IUCN (2011) have identified that approximately 3,500 to 4,000 hectares of former mangrove lands were converted to salt farms in Kampot Province and Kep Municipality, even though salt pans negatively affect mangrove growth and soil fertility. Moreover, a study by the Ministry of Environment (MoE et al. 2014) shows that mangroves in Prey Nob District in Preah Sihanouk Province are under threat by salt, charcoal use, and industrial development.

In addition, an estimated 3,446 hectares of area in Preah Sihanouk province and 343 hectares of Kep province will be below mean sea level if the sea level rises by 1 metre in the future. A study by the Ministry of Environment also estimated that 3,530 hectares of mangroves in Preah Sihanouk and 13 hectares in

Kep are located within 1 metre above today's mean sea level. Therefore, simultaneous occurrence of changes of the mangrove systems and sea level rise will accelerate coastal erosion as well as reduce the adaptive capacity to climate change of the coastal ecosystem.<sup>[2]</sup>

Combined with other climate change impacts such as increasing temperatures and significant reductions in rainfall, the Kep and Preah Sihanouk provinces have existing and future environmental issues to manage. Water resources and waste management practices exacerbate the pressures on the existing environment and ecosystems.

Overall Cambodia's population is growing at a rate of 1.6% annually. Along the coastline the cities of Sihanoukville, Kampot and Kep are among the most populated areas. While household poverty rates are the highest in the north-east of the country, overall poverty rates remain high in the coastal area, especially considering its higher population density.

The country's coastal population faces challenges such as low levels of education and poor health and basic infrastructure services. It further shows an on-going deterioration of inequality between the mid-1990s and 2007, despite an overall poverty reduction.

The expected impacts of climate change in coastal regions jeopardize poverty reduction and health targets, because hazards are likely to increase in frequency and intensity. This is due to the fact that poor communities predominantly live in high-risk areas and already lack access to basic services. Especially the frequency of storms and inundation, which are projected to increase with climate change, create disruptive situations and conditions for the spread of water- and vector-borne diseases, limit access to clean water and food, flood and expose unsafe sanitation facilities, and isolate the population from health and other emergency services and responses. Notwithstanding advances in water, sanitation, and hygiene over recent years, the aforementioned issues are a present danger and cause loss of life and have long-lasting impacts on poverty and food security. Approaches to deliver these services need to become sensitive to the impacts of climate change and related hazards. As a means to significantly reduce vulnerability, citizens need to get access to resilient basic infrastructure services such as clean water, sewage, roads, electricity, or telecommunication, to name a few, and improving their resilience to natural disasters.

In Sihanoukville between 30-50% of households have access to improved water sources. Kep does not have any access to piped water. Consultation confirmed that access to latrines and water filters is also minimal in many areas.

Components 1, 2 and 2 consist of capacity building and training, workshops, community consultations, training events, information sharing through print and web-based means. Thus, they are not expected to have environmental or social impacts. The only potential risk related to these activities is the unequal involvement of different groups in processes. This will be mitigated through quota systems, where possible, and full transparency of processes through engagement with both local governments and beneficiaries.

Consultation outlined that across all communes, integration and equality is a strong focus. Opportunities for women and youth to be more integrated into community initiatives and employment opportunities and growth is evident and verified. Continued consultation with communes, including women, youth and

<sup>[2]</sup> MoE, GEF and UNEP (2013), p. 190.

minority groups, will be undertaken throughout project implementation to ensure any new risks and impacts can be identified and addressed, on the understanding that the situation can change between the last consultation with communities, undertaken in October 2018, and the commencement of project implementation, which is unlikely to start before October 2019.

### **Component 3 – Risk, impact, mitigation and monitoring**

Due to the specific nature of outputs (investments) under Component 3, detailed assessments of each of the proposed investments have been undertaken assessing the existing social and environmental constraints, considerations and desired outcomes. The management and monitoring of risks during design and implementation are outlined within these assessments. The assessments are included in Annexes 1&2 of the proposal.

The below subsections consider the existing environment and current impacts in target each area due to climate change. The risk of impacts due to the proposed investments are also outlined in terms of significance, in consideration of the AF principles, along with defined mitigation measures. The table at the end of this section summarises the outcomes of the impact assessment process relevant to providing clear guidance under this ESMP.

It should be noted that the proposed investments will all require site specific management planning through implementation to ensure risks are properly addressed, understood and mitigated through the works. In some cases this will require site specific environmental and social management plans, and the potential to update the plans for each investment should remain in place until completion of the project.

#### **3.1 Mangrove Plantations for Improved Coastal Resilience**

Consultations with local communes in Kep Province and Prey Nob District have identified that coastal communities are being impacted by climate change and its effects on the coastal environment, leading to serious consequences for local people. The identified environmental impacts listed below can be attributed to a combination of declining mangrove ecosystems and/or insufficient coverage by existing mangrove reserves and the impacts of climate change:

- Significant reduction in fish levels for local fishermen and women;
- Coastal erosion leading to loss in coastal agricultural land and damage to coastal infrastructure;
- Storm surges resulting in salt water ingress into the local agricultural land and surface water, resulting in decreasing agricultural productivity and surface water availability;
- Reduced resilience of houses in the coastal area to flooding and high winds, contributing to potential loss of life and property damage.

This investment will plant mangroves along the coast in Prey Thom, Kep Pong Teuk and Angkaol Communes in Kep Province and Prey Nob Commune in Prey Nob District to establish mangrove protected areas in these locations. These sites have been selected due to an initial screening process and meeting criteria for a high likelihood of success.

The case of environmental and socio-economic benefits for this investment are strong: as per the International Federation of Red Cross and Red Crescent Societies (IFRC) study dated 2011 *Mangrove plantation in Viet Nam: measuring impact and cost benefit* the plantation of mangroves over a 30-year

period is estimated to provide benefits per hectare of mangrove plantation 28 to 104 times the initial establishment costs.

There is a low risk that marginalised and vulnerable groups may be negatively impacted due to rehabilitation works. However poor and informal settlements, women, elderly, disabled and youth have been consulted, and there are no anticipated issues regarding marginalised groups as there is no potential for discrimination or favour in the protections offered by the mangrove plantations.

Poor and informal settlements, women, elderly, disabled and youth have been consulted, however, while there is always a risk that marginalised and vulnerable groups may be negatively impacted due to rehabilitation works, there are no anticipated issues regarding marginalised groups as there is no potential for discrimination or favour in the protections offered by the mangrove plantations.

A Mangrove Planting Management Plan will be developed before planting begins, which will aim to ensure the broader community as well as the government are involved in planting and the ongoing protection of mangrove zones. Continued consultation with potentially vulnerable groups is also proposed, integrating with outputs of Components 1 and 2.

There is a low risk that rehabilitation works if not undertaken properly and in accordance with a Mangrove Management plan, could have an impact on surrounding coastal habitats. The Mangrove Planting Management Plan will ensure that selected mangroves for plantation are suitable for the environment and will support the local ecosystem. An ecologist trained in mangrove ecology will be involved in development of the plan, which will be approved by the Project Manager and the PMC.

As specialist labour external to commune workforces (i.e. those hired under the People's Process) may be required for mangrove rehabilitation works and there is a low risk that contractors engaged do not comply with ILO standards. Where possible, planting of mangroves will draw upon labour from the community. It will be important to ensure compliance with ILO standards for all workers. For example, provision of safety equipment (where necessary), employing adults under contracts, non-discrimination and paying fair salaries above the national minimum wage. These safeguard requirements will be written into agreements with external contractors.

Refer to the table below for a summary of impact assessment, mitigation and monitoring for this investment.

### **3.2a Water gate repair and 3.2b Canal Rehabilitation (Angkaol and Pong Teuk)**

Pong Teuk and Angkaol Communes are predominantly rural agricultural areas, obtaining their livelihood from rice and other cultivations (e.g fruit and vegetables). Both communes have been affected by fluvial flooding due a lack of drainage capacity. Reservoirs in the communities are not well operated and the canals are heavily silted up, which causes the capacity shortage. Besides draining during wet conditions, the canals provide an irrigation function for the rice paddy fields in the area. This makes the shallow canals more preferred in the dry season, while in the rainy season this causes problems due the lack of capacity.

The state of the current infrastructure means that the communities don't benefit from the existence of water gates. Increasing periods of water shortage due to decreased rainfall as a result of climate change enhance the problem of a non-functional irrigation system. Rice farmers depending on this water source for irrigation and all those dependent on it for domestic water use are likely to face increasing problems with water shortages in the dry season in the near future.

The communities need a more resilient approach to water management, building resilience to natural hazards refers to the ability to protect lives, livelihoods and infrastructure from destruction and damage, and to the capability to restore areas after natural hazard has occurred. This project seeks to improve the resilience of the affected communes to the vulnerability of low discharge capacity due to silted canals and vulnerability of increasing rainfall events and longer periods of droughts causing water shortage for cropping by the provision of:

- Canal maintenance and re-lining of the most silted up canals
- Capacity building on canal maintenance
- Gate repair.

#### **Water gate repair**

There exists a moderate risk that an intervention may not be accessible to the entire community. However, research and consultation undertaken confirms expectation that entire communes would benefit. All groups within communes were consulted in depth, and there was no expression of concern of unequal access. It was confirmed that the repair of the gate will improve access to water to the entire community (Angkaol and Pong Teuk communes). The gates make it possible to have controlled waterflow and thereby improve the existing water system. Because the water bodies are all public land, it is expected that the water will be a 'public good' whereby it will not be possible to prevent individuals or groups from using it. Indeed, it will enhance the ability of all target beneficiaries to access water.

Even though poor and informal settlements, women, elderly, disabled and youth have been consulted through project development, there is low risk that marginalised and vulnerable groups may be negatively impacted due to rehabilitation works, though there are no anticipated issues regarding marginalised groups as there is no potential for discrimination or favour in the repair of the water gate. Continued consultation will be undertaken with any potentially marginalised groups identified during project implementation.

There is a low risk that core labour rights may be impacted as skilled labour external to commune workforce (i.e. those hired under the People's Process) may be required. The implementation of the project will need to ensure any contractors engaged for rehabilitation works comply with ILO standards, by, for example, providing safety equipment (where necessary), employing adults under contracts, non-discrimination and paying fair salaries above the national minimum wage. This will be written into any contractual agreement.

There is a low risk that the water quality of water adjacent to canal construction may be impacted due to mobile sediment causing turbidity, and/or pollution from construction activities (e.g use of cement). This could intern impact on public health. Improper design of the water gate could also impact water quality and flow. Verification of the design of will be required prior to engagement of any contractor and implementation of the works. The project's engineer (or an engineer nominated by the PMC) will review the works prior to their commencement.

Overall, water resource efficiency will be improved by the installation of the gate and repair and associated structures. The possibility to effectively divide the water makes the communes more resilient to longer periods of draught with more efficient resource management. Proper storage of fresh water increases the commune's access to fresh water, which a direct benefit to public health. There will, however, be a need for any contractors and labour force to comply with required health standards.

### **Canal rehabilitation**

Canal rehabilitation works propose a low risk impacting on human rights as the land through which the canals traverse is a combination of public/informal and residential use (though the canals themselves are public land, but they are bordered by private land). The implementation project must not impede on tenure arrangements or property rights. Consultation undertaken has confirmed that the capacity building programme nor the rehabilitation of the canals will conflict with human rights, however, further follow up consultation through project implementation will be undertaken to ensure all beneficiaries accept works and that tenure arrangements and property rights are not violated. At present, those living nearby expressed strong support for these works, as they are also the primary beneficiaries.

There is a moderate risk triggering potential involuntary resettlement, although inhabitants (including directly affected) proposed and confirmed agreement with rehabilitation of the canals in Angkaol and Pong Teuk Communes, an involuntary settlement may need to be rechecked to ensure inhabitants are not resettled involuntarily due to changes in water flow. The works all involve work on state-public land. No one is currently occupying the land that is being used, and the repair work on the canals will not involve flooding or any other displacement that could force the resettlement of nearby people. Therefore, no involuntary resettlement is likely to be required or occur as a by-product of the investment. However, ongoing consultation through implementation phase will be undertaken to ensure this is still the case.

There is a low risk that rehabilitation works within and surrounding the canal could have an impact on the surrounding natural habitat and/or an indirect impact on biological diversity. Although no critical habitat or protected areas are confirmed within the works area, and the area where the gates are constructed is solely agricultural land, rehabilitation of the canals can cause temporarily disturbance of species living in the canals. By doing the work in section and keeping the water flow at all times will limit the damage to species, and all care must be taken to ensure no degradation of natural habitat and protection of surrounding ecosystems. As accessing the terrain temporarily might require crossing private property, to prevent damage to crops, rehabilitation work needs to be planned in between cropping cycles, and will therefore take place during the dry season.

during construction (e.g use of cement). Improper design of the canal could also impact water quality and flow. Verification of design is required and will be conducted by the project engineer. Overall, resource efficiency will be improved by relining the canals and the larger discharge capacity will make the commune less vulnerable to climate change and allows for more efficient resource management. The rehabilitation of the canals will also prevent flooding, therefore reduces chances of negative effects on public health by reducing the spread of contaminated water. However, project implementation will need to ensure contractors comply with health standards.

### **3.3 Prevention of salt water ingress through river channels – embankment and water gate (Angkaol and Pong Teuk)**

In both Angkaol and Pong Teuk Communes, the land through which the canals traverse is a combination of public / informal and residential use, predominantly used for agricultural purposes. This was confirmed via consultations, however there is a low risk that unknown or unidentified tenure issues may arise during embankment works and construction of the water gate or embankments. The investment must not impede on tenure arrangements or property rights, therefore further follow up consultation through project implementation should be undertaken to ensure all beneficiaries accept works and that tenure arrangements and property rights are not violated. This is also important to verify that there have not been changes in the tenure arrangement since the project's final consultations in October 2018.

Although inhabitants (including those who will be directly affected by the investment) proposed and confirmed agreement with embankment and water gates the project needs to ensure inhabitants are not resettled involuntarily due to changes in water flow. There is a low risk that resettlement may be required as a result of this investment if flows are redefined. However, the design is developed to improve water flow amenity in both directions.

There is a low risk that embankment works and construction of the water gates could have an impact on the surrounding natural habitat. Although no critical habitat or protected areas are confirmed within the works area, all care needs to be taken to ensure no degradation of natural habitat. The rehabilitated mangrove areas will define the boundary between the shoreline (salt water mangrove) and cultivated rice paddies. As such it will help to prevent further erosion of the mangrove forest. The presence of a water gate across the river will also form a barrier to downstream flow of solid waste entrained in the river, which could then be removed more easily rather than flushing out to sea. In this sense, the project provides two positive benefits to the natural habitat; 1) the defence and protection of mangroves, and 2) the protection of the ocean against solid waste.

The works will require heavy components and machinery to be brought to site, and there is currently no suitable road for large vehicles to access to within 1km. Therefore, a temporary trackway will need to be installed to enable access. There is a risk of environmental impact if the temporary road is not satisfactorily constructed and safely removed again after the completion of the works. However, if communities and the local government conclude that the track is beneficial to them, it can be kept and formalised.

The works adjoin mangrove forest and it will be necessary to widen the footprint of the existing path separating the mangrove from the agricultural land. Care should be taken to minimise the impact on the mangrove.

There is also a low risk that embankment work and construction of the water gates could have an indirect impact on biological diversity. Material imported to construct the raised embankment should be environmentally screened to ensure that there are no invasive species brought to site.

There is a low risk of impact to water quality within adjacent canal during construction (e.g. use of cement). Improper design of embankments and water gates could impact water quality and flow. Verification of design upon inception is required. Environmental safeguards should be applied during the construction works to ensure no cement or oils are allowed into the environment.

There is a low risk that impacts to water quality could in turn effect public health of downstream users. However, as all contractors will comply with required health standards and regulations, and improvement to flow should benefit public health by improving crop production, no negative impacts are expected.

### **3.4 O Thmar reservoir enhancement (Angkaol)**

Angkaol Commune is predominantly rural landscape, with existing natural vegetation within and surrounding a combination of public/ informal and agricultural use. Whilst land use and tenure was confirmed via consultation, there is a low risk that the implementation of the project might impede on tenure arrangements or property rights. Although enhancements to the reservoir are not anticipated to raise any issues regarding human rights, further follow up consultation through project implementation should be undertaken to ensure all beneficiaries accept the proposed works and that tenure arrangements and property rights are not violated.

There is a low risk that labour rights and safety of workers may be impacted as specialist labour external to commune workforce (i.e. those hired under the People's Process) may be required. There will be the need to ensure any contractors engaged for rehabilitation works comply with ILO standards by, for example, providing safety equipment (where necessary), employing adults under contracts, non-discrimination and paying fair salaries above the national minimum wage. All these conditions will be written into legal contracts with the contractors. The choice of contractor/s must meet the requirements for this project to ensure adequate risk mitigation is implemented. Engineering certification required for the design of the works.

Although inhabitants (including directly affected) proposed and confirmed agreement with the need to enhance the reservoir, there is a low risk that unidentified inhabitants exist. The works all involve work on public state-owned land, however the project needs to ensure inhabitants are not resettled involuntarily due to changes in water flow, ongoing consultation prior and through implementation is required.

There is a low risk that works on the reservoir could have an impact on the surrounding natural habitat. Although no critical habitat or protected areas are confirmed within the works area, all care needs to be taken to ensure no degradation of natural habitat.

There is a low risk that embankment works and construction of water gates could have an indirect impact on biological diversity. The waterbody in its current state is home to vegetation and aquatic plant life but has no official status as natural habitat. O Thmar is not a natural lake and it is not in a protected area, however, excavation works may lower the biological diversity temporarily. The use of a silt curtain (or similar) to contain sediment during excavation works will be implemented to protect aquatic plants as far



as possible.

There is a low risk that excavation works to the reservoir could impact on water quality within the reservoir and adjacent canal system. Construction methodologies will consider the need to protect the existing water quality. Improper design of the works could also impact water quality and flow. Verification of the design by a certified engineer is required to ensure the design adequately mitigates any negative impact to water quality and flow. Water resource management within the communes will be improved as the enhancement of the reservoir enlarges the water resource capacity, creating a more sustainable fresh water source. The enhanced reservoir should also benefit public health and livelihoods by improving crop production.

### **3.4b Refurbish Roness Reservoir**

Roness reservoir is well-positioned to provide a water supply to much of Pong Teuk, Kep, Angkaol and Prey Thom Communes and as such the majority of the communities will have a stake in its refurbishment and will be supportive of any works. As identified above, there is a small community of approximately 50 people living in a village immediately to the east of Roness Dam, some of whom currently cultivate land within the reservoir footprint. It will be necessary to engage with these people to ensure they are able to effectively adapt to any change in the reservoir water level that occurs at a later date following completion of the investigation and design proposed in this investment.

In the construction, the existing dam material will be re-used and strengthened as much as possible. Other details of the physical works are as above.

#### **§ Environmental**

The works will require drilling and construction machinery and materials to be brought to site, and the existing road may require modification to enable access. Any disruption as a result of the road works should be kept to a minimum.

#### **§ Social Safeguards**

Full engagement should take place with the neighbouring community and training put in place with the workforce to ensure good working relations are maintained throughout the works.

### **3.5 Resilient housing (Kep Province and Prey Nob District - all communes)**

Although all groups within communes were consulted in depth and no expression of concern of unequal access, there exists a low risk that an intervention may not be accessible to the entire community. Research and consultation undertaken confirms expectation that entire communes would benefit and any existing inequities would not be exacerbated but improved. Education opportunities provided within this project will be targeted to the marginalised and/or enhance the local capacity of the region which is in turn beneficial to all. The location of demo houses will be on state public land and re-confirmed before construction to ensure access and equity for all beneficiaries.

Impoverished and informal settlements, women, elderly, disabled and youth (where possible) have been consulted, however there is a low risk that marginalised and vulnerable groups may be negatively impacted due proposed interventions. There are no anticipated issues regarding marginalised groups as none were identified as being located within these communes. In fact, this project will:

- Provide new economic and livelihood options to the marginalised;
- Improve housing resilience for the marginalised and vulnerable.
- Continued consultation with any potentially marginalised groups identified during project implementation.

The land to which these interventions is applicable is a combination of public/informal and residential use. This was confirmed via consultations however there is a low risk that the project may impede on tenure arrangements or property rights. Continued consultations will take place throughout project implementation to ensure all beneficiaries accept the works and that tenure arrangements and property rights are not violated. The demonstration houses will all be on state-public land.

There exists a low risk that housing resilience capacity building would focus predominantly on men. However, the housing resilience project will aim to provide equal training opportunities to both men and women. Women will benefit from resilient houses because they more typically stay at home, are more likely to be affected by damage to houses and are more likely to source materials for the repair of houses.

Specialist labour external to commune workforce may be required for the construction of the demonstration houses. There is a low risk that labour rights may be impacted, hence there is a need to ensure any contractors engaged for works comply with ILO standards. Safety equipment will be required for workers on the site.

There is a low risk that if proper training is not provided for housing resilience, safety issues may continue. The housing resilience program assists with the provision of safer housing for the marginalised during adverse weather events. Continued engagement with community with regards to development of housing styles and construction techniques, and development of hazard maps is critical. This investment is also supported by activities under Output 1.2, which will enhance the capacity building efforts to a greater number of people.

### **3.6 Raised embankment and water gate repair (Ou Oknha Heng, Prey Nob, Ou Chrou and Veal communes)**

The communities of Prey Nob District lying on the west side of the Kampong Smach Estuary have been protected from sea flooding since 2001 by an earth embankment and roadway separating the rice fields from the mangrove forest. On the landward side of the embankment is a 30m wide flood drainage canal for conveying fresh water floods in the rainy season and this empties under the embankment through a series of 36 manually-operated vertical sluice water gates. Repairs are required to several of the water gates. There are also locations where the current flood embankment is being overtopped in severe storms, and there is a need to identify low points as a preliminary to any future project to raise and improve the embankment. Raising areas of the embankment where there are identified low points will enable some targeted repairs improving the functionality of the existing flood embankment, incurring immediate benefits to the surrounding communes due to protection from saltwater ingress.

Both the estuary and the canal system behind the embankment provide for the livelihood of the surrounding communes of Ou Oknha Heng, Prey Nob, Ou Chrou and Veal. The estuary is a diverse ecosystem with a healthy mangrove system providing habitat for a diverse range of coastal species of fish and crustaceans, a highly relied upon source of food for locals. The canal system provides a freshwater

source of water and directly feeds approximately 2,000 hectares of rice fields which support the broader surrounding communes.

All groups within the surrounding communes were consulted in depth, and no expression of concern of unequal access to the benefits from the proposed works was identified. However, there exists a low risk that an intervention may not be accessible to the entire community. All research and consultation undertaken in the preparation of this project supports the expectation that entire communes would benefit.

2 - The investment will deliver reduced instances of salt water ingress into agricultural land, improving the likelihood of high crop yields and protecting the income and food supply for a significant number of people in the Prey Nob district. The agricultural and fishing communities living in the informal areas of settlement will experience improved access and improved food security.

Impoverished and informal settlements, women, elderly, disabled and youth within the communes have been consulted, however there is always a low risk that marginalised and vulnerable groups may be negatively impacted due proposed interventions. There are no anticipated issues regarding marginalised groups as none were identified as being located within these communes. However, there is some old data to suggest that a small number of undocumented ethnic Vietnamese live in Prey Nob District. This was repeatedly cross-checked with the elected Commune Council representatives and provincial level officials, who both assert that all undocumented ethnic Vietnamese living in the area have now been formalized and given Cambodian identity papers.

There exists a low risk that this investment (while being implemented) focuses benefits predominantly on the male population with regards to local labour force. In the poor communities affected by the proposal it was observed that women tend to take more of a household and community management role and therefore they are likely to benefit further from the community's improved crop yield, as they will be likely to take on the role of selling surplus crops. The men will benefit from improved yields from their labours. If the road overtops less frequently there will also be improved access to the market for all.

Specialist labour external to provincial workforce may be required for the embankment works and repairs to water gates. There is a low risk that labour rights may be impacted, hence there is a need to ensure any contractors engaged for rehabilitation works comply with ILO standards by, for example, providing safety equipment (where necessary), employing adults under contracts, non-discrimination and paying fair salaries above the national minimum wage.

Although inhabitants (including directly living along the embankment/sea defence) proposed and confirmed agreement with the need to prepare water gate and low points along sea defence, there is a low risk that some inhabitants are still unidentified. The project needs to ensure inhabitants are not resettled involuntarily due to changes in water flow, therefore continued consultation through implementation is required. Without this investment, resettlement of the informal communities living along the ocean side of the embankment would be inevitable.

There is a moderate risk that works on the sea defence and water gate could have an impact on the surrounding natural habitat. Although in many areas the existing mangroves have been cleared and cut down for use as building materials, they are now considered protected area and all care needs to be taken to ensure no degradation of natural habitat. Contractors are to be made aware of the implications of

removing or damaging mangroves. No clearing of mangroves is required for the proposed works. The investment will help to maintain the boundary between salt water mangrove and cultivated rice paddies. As such it will help to prevent further erosion of the mangrove forest. There are areas of mangrove to seaward of the existing flood defence embankment that appear to have been previously cleared for cultivation but are now returning to nature. A separate investment will address re-planting these areas.

There is a low risk that works on the sea defence and construction of water gate could have an indirect impact on biological diversity. Material imported to repair and consolidate the embankment should be environmentally screened prior to commencement of construction to ensure that there are no invasive species brought to site.

There is a low risk that the project will impact emissions which may contribute to climate change due to CO2 emissions associated with the construction period only (machinery emissions). However, this will be temporary and controlled via use of modern and well-maintained equipment. The investment will however help to offset the effects of climate change for the poor local communities.

There is a low risk of impacts to water quality within estuary and adjacent canal system during construction (grading works, use of cement). Improper design could impact water quality and flow, therefore controlled construction methodologies and verification of design is required. Environmental safeguards will be applied during the construction works to ensure no cement or oils are allowed into the environment. The works will reduce the instances of pollution by improving performance of the existing embankment and water gates to better control flood flows.

There is a moderate risk that improper design and construction of the embankment and water gate repair works may result in negative impacts to soil and underlying groundwater condition. Design and construction methodologies should be certified by a suitably qualified engineer prior to the beginning of the construction works. The works will reduce the likelihood of salinization and soil degradation by preventing upstream salt water ingress. This will improve the quality of the agricultural soil. Moreover, the raised embankment will improve future capacity to adapt to sea-level rise.

### **3.7 Drainage and rainwater harvesting in Veal Rinh Market**

Veal Rinh Market and its surroundings consist of about 18 hectares of commercial land located between the railway and National Road 4 in Veal Rinh Commune, Prey Nob District. The market is accessed by the entire community for food (including fresh meat, fruit and vegetables) and goods such as clothing and domestic products. The area suffers from storm water flooding in the rainy season, making it inaccessible and unsafe during and after periods of heavy rain. These flooding periods also cause the loss or reduction in incomes for the people who trade in the market. The stretch of land between the road and the market area has the lowest elevation level. The current drainage system is poorly maintained and is too small to deal with the increasingly intense rainfall events that are likely to occur as a result of climate change. Therefore, floods occur inside and in front of the market in every time it rains.

Although All groups within communes consulted in depth and no expression of concern of unequal access, there exists a low risk that the drainage works proposed may not be accessible to the entire community. Research and consultation undertaken however confirms the expectation that entire communes would benefit. The new drainage system and landscape works along the road will improve safety from flooding to all stakeholders in this area, and all housing in this area can connect their rainwater pipe direct or

indirect to the rainwater system. Proactive measures will be taken to ensure that people (and especially sellers, who are primarily women) can still access the market while the works are ongoing. Overall, access to the market through the rainy season will benefit all in the commune as it is the main market place for provisions, food and goods.

There is a low risk that installation of the drainage and rainwater system will focus predominantly on the male population with regards to installation work. However, the overall project design is primarily designed to improve safety and access to the market, which is a direct benefit to women. It is estimated that 90% of the sellers in the market are women, so the incomes that will be safeguarded and increased as a result of the project will primarily benefit women.

Specialist labour external to provincial workforce may be required, therefore there is a low risk that labour rights may be impacted. The project will ensure any contractors engaged for rehabilitation works comply with ILO standards. Safety issues are critical as labourers will be working in the vicinity of National Road 4, the main highway between Sihanoukville and Phnom Penh. Further, as unskilled labour will be provided by the community, safety training and appropriate equipment, support and monitoring will be required and provided by the project.

There is a moderate risk that the works will impact water quality within the surrounding catchment due to redirected runoff water (containing sediment) and flow in adjacent water ways. Improper design could impact water quality and flow therefore verification of the design is required prior to construction. The waste and pollution at the discharging point is taken into account in the design. An eco-treatment system will be included at the discharging point to control waste and pollution to the waterways.

There is a low risk that if not designed and constructed correctly, the enhanced drainage system may cause indirect impacts to public health via decreased water quality. However, the design of the enhanced drainage system will redirect captured runoff meaning there is a low risk of contaminants entering the surrounding water ways. The better drainage system will reduce the stagnant water, therefore disease from viruses, bacteria and microorganisms, as well as local breeding grounds for mosquitoes, which in this area can carry Dengue Fever will be decreased as a result.

### **3.8 Tide gauge with early warning system broadcast capabilities (Teuk La'k, Ou Okhna Heng)**

The communities of Prey Nob district lying on the coastal plain either side of the Kampong Smach estuary are increasingly experiencing flooding from the sea, and a sea defence embankment built in the period 1997-2001 is now reported as being overtopped every 2-3 years. There is a tide gauge within Preah Sihanouk province at Sihanoukville port, but this is on the opposite side of the Sihanoukville peninsula and does not necessarily record data reflecting the unusual tidal circumstances at the Kampong Smach, which has a shallow offshore shelf, a funnelling estuary mouth and the effects of several offshore islands affecting the tidal regime.

The Preah Sihanouk Provincial Department of Meteorology and Water Resources has requested installation of a tide gauge at the outer edge of the mangrove forest at Ou Okhna Heng, to provide accurate data on sea level rise in this location and thereby improve flood warning capability for the low-lying communities of Prey Nob district on both sides of the Kampong Smach.

The proposed location is 700m from the Prey Nob sea defence embankment at the outer edge of the mangrove, on the edge of open sea water. At high tide the depth to the muddy sea bed is only 1.7m, and the mangroves reach approx. 15m height. This location has been selected by the Preah Sihanouk Department of Water Resources and Meteorology as a relatively accessible location within the bay beyond the Kampong Smach Estuary. The bay here is very shallow, reaching no more than 3m water depth at normal high tide over 1km beyond the mangrove according to openly available bathymetric mapping. A tide gauge at this location will be able to give a good representation of the tidal regime within the entire bay.

Although all groups within communes were consulted in depth and no expression of concern of unequal access, there is a low risk that an intervention may not be accessible to the entire community. Research and consultation undertaken confirms expectation that entire communes would benefit from the tide gauge. In particular, the tide gauge will deliver improved warning and understanding of high tides and enable better preparation for protection against sea water ingress into agricultural areas. This will help build local resilience to all the communities living in close proximity to the sea within Prey Nob district. It is generally the case that the poorest and most marginalized live in informal settlements on the edge of the mangrove and these communities stand the most to gain from improved flood warnings.

Specialist labour external to provincial workforce may be required, therefore there is a low risk that labour rights will be impacted. There is a need to ensure any contractors engaged for works comply with ILO standards by, for example, providing safety equipment (where necessary), employing adults under contracts, non-discrimination and paying fair salaries above the national minimum wage.

**Table 3.1 - Potential risks, preventative measures and monitoring for activities under Components 1 and 2**

Component	Outputs	Potential risk areas	Preventive measure	Monitoring arrangements	
				Indicator and methods	Frequency and responsibility
<p>Component 1</p> <p>Community-scale knowledge and capacity enhanced to sustain the adaptation benefits of the project's investments</p>	<p><b>Output 1.1</b> Community capacity built to collect and manage solid waste in all communes within Kep and Preah Sihanouk provinces.</p> <p><b>Output 1.2.</b> Communities in target areas (in all communes within Kep and Preah Sihanouk provinces) have been trained on resilient house construction techniques.</p> <p><b>Output 1.3</b> Communities (all communes within Kep and Preah Sihanouk Provinces) have been organised to manage, monitor and maintain the infrastructure investments under Component 3.</p>	<p>2, 3 and 5: Risk that different groups are not equally involved in capacity building forums and/or training</p>	<p>Communities will be organized and integrated, and quotas will be used to ensure different groups are included / represented.</p> <p>For government workshops and trainings, gender quotas will apply. Continued consultation will be undertaken with community and government through implementation stages.</p>	<p>Meeting attendance sheets with quota numbers and photographs</p> <p>Review of documentation, processes and outputs.</p>	<p>Before and after training, workshops and plans</p> <p>project manager</p>

<p>Component 2</p> <p>Government planning and technical capacity enhanced to sustain and enhance the project's adaptation benefits</p>	<p><b>Output 2.1</b> Government officers at the provincial and district level (within Kep and Preah Sihanouk provinces) trained to plan effectively for sustaining and enhancing the project's adaptation benefits.</p> <p><b>Output 2.2</b> Government officers at the provincial and district level (within Kep and Preah Sihanouk provinces) provided with comprehensive technical training to manage, operate and maintain the infrastructure</p> <p><b>Output 2.3.</b> Institutional systems strengthened to monitor adaptation investments and replicate their benefits</p>				
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**Table 3.2 - Potential risks, mitigation measures and monitoring for investments under Component 3**

Output	AF triggered, risk of potential impact and significance score	Measure to avoid or mitigate potential risks	Monitoring indicator	Frequency and responsibility monitoring
<p>3.1</p> <p>285ha of Mangroves restored in Kep City and Angkaol Communes, Kep Province</p>	<p>3 - Poor and informal settlements, women, elderly, disabled and youth have been consulted, however, while there is always a risk that marginalised and vulnerable groups may be negatively impacted due to rehabilitation works, there are no anticipated issues regarding marginalised groups as there is no potential for discrimination or favour in the protections offered by the mangrove plantations.</p> <p><b>Unlikely x Marginal = Low</b></p> <p>6 – Specialist labour external to commune workforce may be required. Need to ensure any contractors engaged for rehabilitation works comply with ILO standards.</p>	<p>3 - Continued consultation with minority groups and inclusion within Mangrove Management plan.</p> <p>6 - Planting the mangrove will draw upon labour from the community. All employment will comply with ILO Standards.</p> <p>9 - A Mangrove Planting Management Plan will be developed and implemented to ensure that selected mangroves for plantation are suitable for the environment and will support the local ecosystem. An ecologist trained in mangrove ecology to be involved in development of the plan.</p>	<p>Attendance sheets with quota numbers and photographs</p> <p>Check contract and signatures</p> <p>Check for compliance with ILO standards</p> <p>Check compliance with Mangrove Planting Management Plan</p>	<p>Pre- commencement and Monthly</p> <p>Local Project Manager</p>



	<p><b>Rare x Marginal = Low</b></p> <p>9 – Rehabilitation works if not undertaken properly and in accordance with a Mangrove Management plan, could have an impact on surrounding coastal habitats.</p> <p><b>Unlikely x Marginal = Low</b></p>		Mangrove mapping	
<p>3.2a</p> <p>Water gates repaired in 3 locations in Pong Teuk and Angkaol</p>	<p>2- All groups within communes consulted in depth, no expression of concern of unequal access. There is a risk that an intervention may not be accessible to the entire community. However, research and consultation undertaken confirms expectation that entire communes would benefit.</p> <p><b>Possible x Marginal = Moderate</b></p> <p>3 - Poor and informal settlements, women, elderly, disabled and youth have been consulted, however, while there is always a risk that marginalised and vulnerable groups may be negatively impacted due to rehabilitation works, there are no anticipated issues regarding marginalised groups as there is no potential for discrimination or favour in the repair of the water gate.</p> <p><b>Unlikely x Marginal = Low</b></p> <p>6 - Specialist labour external to commune workforce may be required. Need to ensure any contractors engaged for rehabilitation works comply with ILO standards, by, for example, providing safety equipment (where necessary), employing adults under contracts, non-discrimination and paying fair salaries above the national minimum wage.</p> <p><b>Unlikely X Marginal = Low</b></p> <p>12 – Impact on water quality within adjacent canal during construction (e.g use of cement). Improper design of water gate could impact water quality and flow. Verification of design required upon inception.</p> <p><b>Unlikely x Marginal = Low</b></p> <p>13 - The storage of fresh water increases the access to fresh water, which is beneficial to public health.</p>	<p>2 - The repair of the gate will improve the access to water to the community. The gates make it possible to have controlled waterflow and thereby improve the existing water system. Because the water bodies are all public land, it is expected that the water will be a ‘public good’ whereby it will not be possible to prevent individuals or groups from using it. Indeed, it will enhance the ability of all target beneficiaries to access water.</p> <p>3 - Continued consultation with any minority groups identified during project implementation.</p> <p>6 - Safety equipment will be required for workers on the site. For further general information on Core Labour Rights as part of the Environmental and Social Safeguard approach of the project, please refer to the proposal document, <a href="#">Part II, Section K</a>.</p> <p>Need to ensure any contractors engaged for rehabilitation works comply with ILO standards, by, for example, providing safety equipment (where necessary), employing adults under contracts, non-discrimination and paying fair salaries above the national minimum wage.</p> <p>12 - Resource efficiency is improved by the installation of the gate and repair of the other two structures. Possibilities to divide the water makes the communes more resilient to longer periods of draught with more efficient resource management.</p> <p>13 - Need to ensure all contractors comply with health standards</p>	<p>Attendance sheets with quota numbers and photographs</p> <p>Consultation notes</p> <p>Verification of design</p> <p>Construction supervision, health and safety manager on site.</p> <p>Check for compliance with ILO standards</p>	<p>Pre-commencement and post meeting/consultation, local Project Manager</p> <p>Pre-construction, certified engineer</p> <p>Pre-commencement and daily Contractor</p> <p>Pre-commencement, Local Project Manager</p>

	<b>Unlikely x Negligible = Low</b>			
3.2b  2 canals rehabilitated in Pong Teuk and Angkaol Communes, Kep Province	<p>4 - The land through which the canals traverse is a combination of public / informal and residential use. This was confirmed via consultations. Project must not impede on tenure arrangements or property rights.</p> <p><b>Unlikely x Marginal = Low</b></p> <p>8 - Although inhabitants (including directly affected) proposed and confirmed agreement with rehabilitation of the canals in Angkaol and Pong Teuk Communes, the project will ensure inhabitants are not resettled involuntarily due to changes in water flow.</p> <p><b>Possible x Marginal = Moderate</b></p> <p>9 - Rehabilitation works within and surrounding the canal could have an impact on the surrounding natural habitat. Although no critical habitat or protected areas are confirmed in or around the works area, due care needs to be taken to ensure no degradation of natural habitat.</p> <p><b>Unlikely x Marginal = Low</b></p> <p>10 - Rehabilitation works within and surrounding the canal could have an indirect impact on biological diversity.</p> <p><b>Unlikely x Marginal = Low</b></p> <p>12 - Impact to water quality within adjacent canal during construction (e.g use of cement). Improper design of canal could impact water quality and flow. Verification of design required.</p> <p><b>Unlikely x Marginal = Low</b></p> <p>13 - The rehabilitation of the canals prevents flooding, therefore reduces chances of negative effects on public health by reducing the spread of contaminated water.</p> <p><b>Unlikely x Marginal = Low</b></p>	<p>4 - Neither the capacity building programme nor the rehabilitation of the canals will conflict with human rights. Further follow up consultation through project implementation should be undertaken to ensure all beneficiaries accept works and that tenure arrangements and property rights are not violated.</p> <p>8 - The works all involve work on public state-owned land. Therefore, no involuntary resettlement is required. No one is currently occupying the land that is being used, and the repair work on the canals will not involve flooding or any other displacement that could force the resettlement of nearby people. Ongoing consultation through implementation phase should be undertaken to ensure this is still the case.</p> <p>9 - The area where the gates are constructed is solely agricultural land. No natural habitat is endangered by canal repair works. Although accessing the terrain temporarily might be crossing private property. To prevent damage to crops, rehabilitation work needs to be planned in between cropping cycles.</p> <p>10 - Rehabilitation of the canals can cause temporarily disturbance of species living in the canals. By doing the work in sections and keeping the water flow at all times will limit the damage to species.</p> <p>12 - Resource efficiency is improved by relining the canals. The larger discharge capacity makes the commune less vulnerable to climate change and allows for more efficient resource management.</p> <p>13 - Need to ensure all contractors comply with health standards.</p>	<p>Attendance sheets with quota numbers and photographs</p> <p>Consultation notes</p> <p>Verification of design</p> <p>Construction supervision, health and safety manager on site.</p> <p>Check for compliance with ILO standards</p>	<p>Pre-commencement and post meeting/consultation</p> <p>Pre-commencement, certified engineer</p> <p>Pre-commencement and daily Contractor</p> <p>Pre-commencement, Local Project Manager</p>

<p>3.3 Prevention of salt water ingress through improved channels</p>	<p>4 - The land through which the canals traverse is a combination of public / informal and residential use. This was confirmed via consultations. The investment must not impede on tenure arrangements or property rights.</p> <p><b>Unlikely x Marginal = Low</b></p> <p>8 - Although inhabitants (including directly affected) proposed and confirmed agreement with embankment and water gates the project needs to ensure inhabitants are not resettled involuntarily due to changes in water flow.</p> <p><b>Unlikely x Marginal = Low</b></p> <p>9 - Embankment works and construction of water gate could have an impact on the surrounding natural habitat. Although no critical habitat or protected areas are confirmed within the works area, all care needs to be taken to ensure no degradation of natural habitat.</p> <p><b>Unlikely x Marginal = Low</b></p> <p>10 - Embankment works and construction of water gate could have an indirect impact on biological diversity.</p> <p><b>Unlikely x Marginal = Low</b></p> <p>12 - Impact to water quality within adjacent canal during construction (e.g use of cement). Improper design of embankment and water gate could impact water quality and flow. Verification of design upon inception required.</p> <p><b>Unlikely x Marginal = Low</b></p> <p>13 – The sub-project should benefit public health by improving crop production. There are no anticipated negative effects.</p> <p><b>Unlikely x Negligible = Low</b></p>	<p>4 – Embankment works and construction of water gate is not anticipated to raise any issues regarding human rights. Further follow up consultation through project implementation should be undertaken to ensure all beneficiaries accept works and that tenure arrangements and property rights are not violated.</p> <p>8 - There is no resettlement required as a result of this investment. Design is developed to improve water flow amenity in both directions.</p> <p>9 - The investment will define the boundary between salt water mangrove and cultivated rice paddies. As such it will help to prevent further erosion of the mangrove forest. The presence of a dam and water gate across the river will also form a barrier to downstream flow of solid waste entrained in the river, which could then be removed more easily rather than flushing out to sea. In this sense, the project provides two positive benefits to the natural habitat; 1) the defence and protection of mangroves, and 2) the protection of the ocean against solid waste.</p> <p>The works will require heavy components and machinery to be brought to site, and there is currently no suitable road for large vehicles to access to within 1km. Therefore, a temporary trackway will need to be installed to enable access. There is a risk of environmental impact if the temporary road is not satisfactorily constructed and safely removed again after the completion of the works.</p> <p>The works adjoin mangrove forest and it will be necessary to widen the footprint of the existing path separating the mangrove from the agricultural land. Care should be taken to minimise the impact on the mangrove.</p> <p>10 - Material imported to construct the raised embankment should be environmentally screened to ensure that there are no invasive species brought to site.</p> <p>12 - Environmental safeguards should be applied during the construction works to ensure no cement or oils are allowed into the environment.</p> <p>13 - All contractors will comply with health standards and</p>	<p>Attendance sheets with quota numbers and photographs</p> <p>Consultation notes</p> <p>Verification of design</p> <p>Construction supervision, health and safety manager on site.</p> <p>Check for compliance with ILO standards</p>	<p>Pre-commencement and post meeting/consultation</p> <p>Pre-commencement, certified engineer</p> <p>Pre-commencement and daily Contractor</p> <p>Pre-commencement, Local Project Manager</p>
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		regulations.		
<p>3.4</p> <p>O Thmar Reservoir rehabilitated to increase water storage capability Kep Province</p> <p><b>Output 3.4b</b> Rones reservoir rehabilitated for enhanced safety and storage</p>	<p>4 - The land in which both existing reservoirs are structured is a combination of public / informal and agricultural use. This was confirmed via consultations. Project must not impede on tenure arrangements, property rights or result in landlessness.</p> <p><b>Unlikely x Marginal = Low</b></p> <p>6 - Specialist labour external to commune workforce may be required. Need to ensure any contractors engaged for rehabilitation works comply with ILO standards</p> <p><b>Possible x Negligible = Low</b></p> <p>8 - Although inhabitants (including directly affected) proposed and confirmed agreement with the need to enhance the reservoirs. The project needs to ensure inhabitants are not resettled involuntarily due to changes in water flow and or the status of the surrounding land.</p> <p><b>Unlikely x Marginal = Low</b></p> <p>9 – Works on the reservoir could have an impact on the surrounding natural habitat. Although no critical habitat or protected areas are confirmed within or immediately outside the works area, due care needs to be taken to ensure no degradation of natural habitat.</p> <p><b>Rare x Marginal = Low</b></p> <p>10 - Embankment works and construction of water gate could have an indirect impact on biological diversity.</p> <p><b>Rare x Negligible = Low</b></p> <p>12 - Impact to water quality within reservoir and adjacent canal system during construction (excavation work). Improper design could impact water quality and flow. Verification of design required.</p> <p><b>Unlikely x Marginal = Low</b></p> <p>13 – The enhanced reservoir should benefit public health by improving crop production. There are no anticipated negative</p>	<p>4 - Enhancements to the reservoir are not anticipated to raise any issues regarding human rights. Further follow up consultation through project implementation should be undertaken to ensure all beneficiaries accept works and that tenure arrangements and property rights are not violated.</p> <p>6 - Labour rights and safety are of particular interest by restoring the reservoir. Choosing a contractor with the right requirements in this project is highly essential for risk mitigation. Engineering certification required.</p> <p>Need to ensure any contractors engaged for rehabilitation works comply with ILO standards, by, for example, providing safety equipment (where necessary), employing adults under contracts, non-discrimination and paying fair salaries above the national minimum wage.</p> <p>8 - The works all involve work on public state-owned land. Therefore, no involuntary resettlement is required. Project implementation to ensure no change to settlements.</p> <p>9 - The water reservoir is not appointed as natural habitat protection area. However, all care will be taken through construction to ensure no degradation of natural habitat.</p> <p>10. The waterbody in its current state is home to vegetation and aquatic plant life, but has no official status as natural habitat. O Thmar is not a natural lake and it is not in a protected area, however, excavation work will lower the biological diversity temporarily. The use of a silt curtain or to contain sediment during dredging works will be implemented to protect aquatic plants as far as possible.</p> <p>12 - Water resources management enlarges with the enhancement of the reservoir. Creating a more sustainable fresh water source.</p>	<p>Attendance sheets with quota numbers and photographs</p> <p>Consultation notes</p> <p>Signatures of acceptance of works and locations</p> <p>Verification of design</p> <p>Construction supervision, health and safety manager on site.</p> <p>Check for compliance with ILO standards</p>	<p>Pre-commencement and post meeting/consultation, Local Project Manager</p> <p>Pre-commencement, certified engineer</p> <p>Pre-commencement and daily, Contractor</p> <p>Pre-commencement, Local Project Manager</p>

	effects. <b>Rare x negligible = Low</b>			
3.5 Resilient Housing designs developed and demonstrations constructed (both provinces)	<p>2- All groups in the target communes were consulted in depth, no expression of concern of unequal access. There exists a risk that an intervention may not be accessible to the entire community. Research and consultation undertaken confirms expectation that entire communes would benefit.</p> <p><b>Rare x Marginal = Low</b></p> <p>3 - Impoverished and informal settlements, women, elderly, disabled and youth (where possible) have been consulted, however there is always a risk that marginalised and vulnerable groups may be negatively impacted due proposed interventions. There are no anticipated issues regarding marginalised groups as none were identified as being located within these communes.</p> <p><b>Unlikely x Marginal = Low</b></p> <p>4 - The land to which these interventions is applicable is a combination of public / informal and residential use. This was confirmed via consultations. Project must not impede on tenure arrangements or property rights.</p> <p><b>Rare x Marginal = Low</b></p> <p>5 – There exists a risk that housing resilience capacity building focuses predominantly on the male population.</p> <p><b>Unlikely x Marginal = Low</b></p> <p>6 - Specialist labour external to commune workforce may be required. Need to ensure any contractors engaged for rehabilitation works comply with ILO standards.</p> <p><b>Unlikely x Marginal = Low</b></p> <p>13 – There is a risk that if proper training is not provided for housing resilience, safety issues may continue.</p> <p><b>Unlikely x Marginal = Low</b></p>	<p>2 – This project will not exacerbate existing inequities. Education opportunities provided within this project will be targeted to the marginalised and/or enhance the local capacity of the region which is in turn beneficial to all. The location of demo houses will be on state public land and re-confirmed before construction to ensure access and equity for all beneficiaries.</p> <p>3 - This project should: provide new economic and livelihood options to the marginalised; improve housing resilience for the marginalised and vulnerable.</p> <p>Continued consultation with any minority groups identified during project implementation.</p> <p>4 - Continued consultations will take place throughout project implementation to ensure all beneficiaries accept works and that tenure arrangements and property rights are not violated.</p> <p>5 - The housing resilience project will aim to provide equal training opportunities to both men and women. Women will benefit from resilient houses because they are more likely to stay at home, are more likely to be affected by damage to houses and are more likely to source materials for the repair of houses</p> <p>6 - Safety equipment will be required for workers on the site. For further general information on Core Labour Rights as part of the Environmental and Social Safeguard approach of the project, please refer to the proposal document, <a href="#">Part II, Section K</a>.</p> <p>The housing resilience program assists with the provision of safer housing for the marginalised during adverse weather events. Extensive training is also provided under Output 1.2</p> <p>Continued engagement with community with regards to development of housing styles and construction techniques, and development of hazard maps is critical.</p>	<p>Attendance sheets with quota numbers and photographs</p> <p>Consultation notes</p> <p>Signatures of acceptance of works and locations</p> <p>Construction supervision, health and safety manager on site.</p> <p>Check for compliance with ILO standards</p> <p>Monitor new builds where possible, record design and construction details.</p>	<p>Pre-commencement and post meeting/consultation, Local Project Manager</p> <p>Pre-commencement and daily, Contractor</p> <p>Pre-commencement, Local Project Manager</p>

<p>3.6 Raised embankment and Watergate repair in Ou Ohkna Heng Commune, P. Sihanouk Province.</p>	<p>2 – All groups in the target communes consulted in depth, no expression of concern of unequal access. There exists a risk that an intervention may not be accessible to the entire community. Research and consultation undertaken confirms expectation that entire communes would benefit.</p> <p><b>Rare x Marginal = Low</b></p> <p>3 – Impoverished and informal settlements, women, elderly, disabled and youth (where possible) have been consulted, however there is always a risk that marginalised and vulnerable groups may be negatively impacted due proposed interventions. There are no anticipated issues regarding marginalised groups as none were identified as being located within these communes.</p> <p><b>Unlikely x Marginal = Low</b></p> <p>5 – There exists a risk that this investment (while being implemented) focuses benefits predominantly on the male population with regards to local labour force.</p> <p><b>Unlikely x Marginal = Low</b></p> <p>6 – Specialist labour external to provincial workforce may be required. Need to ensure any contractors engaged for rehabilitation works comply with ILO standards</p> <p><b>Unlikely x Marginal = Low</b></p> <p>8 – Although inhabitants (including directly living along the embankment/sea defence) proposed and confirmed agreement with the need to prepare water gate and low points along sea defence project needs to ensure inhabitants are not resettled involuntarily due to changes in water flow.</p> <p><b>Unlikely x Marginal = Low</b></p> <p>9 – Works on the sea defence and water gate could have an impact on the surrounding natural habitat. Although in many areas the existing mangroves have been cleared and cut down for use as building materials, they are now considered protected area and all care needs to be taken to ensure no</p>	<p>2 - The investment will deliver reduced instances of salt water ingress into agricultural land, improving the likelihood of high crop yields and protecting the income and food supply for a significant number of people in the Prey Nob district. The agricultural and fishing communities living in the informal areas of settlement will experience improved access and improved food security.</p> <p>The investment will not discriminate in the services it provides to the target beneficiaries.</p> <p>3 - There are no anticipated issues regarding marginalised groups. There is some old data to suggest that small number of undocumented ethnic Vietnamese live in Prey Nob district, but this was cross-checked with the elected Commune Council representatives and provincial level officials, who both assert that all undocumented ethnic Vietnamese have now been formalized and given Cambodian identity papers.</p> <p>As above, there is no potential for discrimination in the benefits provided by the infrastructure this investment will provide.</p> <p>5 - In the poor communities affected by the proposal it was observed that women tend to take more of a household and community management role and therefore they are likely to benefit further from the community's improved crop yield, as they will be likely to take on the role of selling surplus crops. The men will benefit from improved yields from their labours. If the road overtops less frequently there will also be improved access to the market for all.</p> <p>6 - Safety equipment will be required for workers on the site. For further general information on Core Labour Rights as part of the Environmental and Social Safeguard approach of the project, please refer to the proposal document, <a href="#">Part II, Section K</a>.</p> <p>Need to ensure any contractors engaged for rehabilitation works comply with ILO standards, by, for example, providing safety equipment (where necessary), employing adults under contracts, non-discrimination and paying fair salaries above the national minimum wage.</p>	<p>Attendance sheets with quota numbers and photographs</p> <p>Consultation notes</p> <p>Signatures of acceptance of works and locations</p> <p>Verification of design</p> <p>Construction supervision, health and safety manager on site.</p> <p>Check for compliance with ILO standards</p> <p>Monitor groundwater when possible</p>	<p>Pre-commencement and post meeting/consultation, Local Project Manager</p> <p>Pre-commencement, certified engineer</p> <p>Pre-commencement and daily, Contractor</p> <p>Pre-commencement, Local Project Manager</p> <p>Commune representatives</p>
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	<p>degradation of natural habitat.</p> <p><b>Possible x Marginal = Moderate</b></p> <p>10 – Works on the sea defence and construction of water gate could have an indirect impact on biological diversity.</p> <p><b>Unlikely x Marginal = Low</b></p> <p>11 – There will be necessary but controlled CO<sub>2</sub> emissions associated with the construction period only.</p> <p><b>Unlikely x Marginal = Low</b></p> <p>12 – Impact to water quality within estuary and adjacent canal system during construction (grading works, use of cement). Improper design could impact water quality and flow. Verification of design required.</p> <p><b>Unlikely x Marginal = Low</b></p> <p>15 – There is a risk that improper design and construction of the sea defence and water gate repair works may result in negative impacts to soil and underlying groundwater condition. Design verification and construction supervision required.</p> <p><b>Unlikely x Critical = Moderate</b></p>	<p>8 - There is no resettlement required as a result of this investment implementation. Without this investment, resettlement of the informal communities living along the ocean side of the embankment would be inevitable.</p> <p>9 - The investment will help to maintain the boundary between salt water mangrove and cultivated rice paddies. As such it will help to prevent further erosion of the mangrove forest. There are areas of mangrove to seaward of the existing flood defence embankment that appear to have been previously cleared for cultivation but are now returning to nature. A separate investment will address re-planting these areas.</p> <p>10 - Material imported to repair and consolidate the embankment should be environmentally screened to ensure that there are no invasive species brought to site.</p> <p>11 - The investment will help to offset the effects of climate change for the poor local communities. There will be necessary but controlled CO<sub>2</sub> emissions associated with the construction period only. However, this will be temporary and controlled via use of modern, well-maintained equipment and pollution control measures</p> <p>12 - Environmental safeguards will be applied during the construction works to ensure no cement or oils are allowed into the environment. The works will reduce the instances of pollution by improving performance of the existing embankment and water gates to better control flood flows.</p> <p>15 - The investment should reduce the instances of salinization and soil degradation by preventing upstream salt water ingress. This will improve the quality of the agricultural soil. Design and construction methodologies to be certified by a suitably qualified engineer.</p>		
<p>3.7</p> <p>Drainage and Rainwater Harvesting installed at Veal Rinh Market, P.</p>	<p>2 – All groups within communes consulted in depth, no expression of concern of unequal access. There exists a risk that an intervention may not be accessible to the entire community. Research and consultation undertaken confirms expectation that entire communes would benefit.</p>	<p>2 - The new drainage system and landscape works along the road will improve safety from flooding to all stakeholders in this area. All stakeholders will get benefit from this project.</p> <p>Every housing in this area can connect their rainwater pipe direct or indirect to the system.</p>	<p>Attendance sheets with quota numbers and photographs</p> <p>Consultation notes</p> <p>Signatures of</p>	<p>Pre-commencement and post meeting/consultation, Local Project Manager</p>

<p>Sihanouk Province</p>	<p><b>Unlikely x Marginal = Low</b></p> <p>5 - There exists a risk that installation of drainage and rainwater system focuses predominantly on the male population with regards to installation work.</p> <p><b>Unlikely x Marginal = Low</b></p> <p>6 – Specialist labour external to provincial workforce may be required. Need to ensure any contractors engaged for rehabilitation works comply with ILO standards</p> <p><b>Unlikely x Marginal = Low</b></p> <p>12 - Impact to water quality within surrounding catchment due to redirected runoff water (containing sediment) and flow in adjacent water ways. Improper design could impact water quality and flow. Verification of design required.</p> <p><b>Possible x Marginal = Moderate</b></p> <p>13 - The enhanced drainage system will redirect captured runoff and there is a low risk of contaminants entering the surrounding water ways and indirectly impacting on public health.</p> <p><b>Unlikely x Marginal = Low</b></p>	<p>Proactive measures will be taken to ensure that people (and especially sellers, who are primarily women) can still access the market while the works are ongoing.</p> <p>5 - The project is primarily designed to benefit women. It is estimated that 90% of the sellers in the market are women, so the incomes that will be safeguarded and increased as a result of the project will primarily be women's</p> <p>6 - Unskilled labour will be provided by the community. Safety issues are critical as labourers will be working in the vicinity of National Road 4, the main highway between Sihanoukville and Phnom Penh. Safety training and appropriate equipment will be given.</p> <p>For further information about the general provisions for the safety of workers, and the safeguarding of their labour rights, please see <a href="#">Part II, Section K</a> of the proposal.</p> <p>12 - The waste and pollution at discharging point is taking account into the design. It is necessary to have an eco-treatment system at the discharging point.</p> <p>13 - The better drainage system will reduce the stagnant water. Disease from virus, bacteria and microorganism can be decreased as a result.</p>	<p>acceptance of works and locations</p> <p>Verification of design</p> <p>Construction supervision, health and safety manager on site.</p> <p>Check ILO certification of contractors</p>	<p>Pre-commencement, certified engineer</p> <p>Pre-commencement and daily Contractor</p> <p>Pre-commencement, Local Project Manager</p>
<p>3.8</p> <p>Tide gauge with early warning system broadcast capabilities installed</p>	<p>2 - All groups within communes consulted in depth, no expression of concern of unequal access. There exists a risk that an intervention may not be accessible to the entire community. Research and consultation undertaken confirms expectation that entire communes would benefit.</p> <p><b>Unlikely x Marginal = Low</b></p> <p>6 - Specialist labour external to provincial workforce may be required. Need to ensure any contractors engaged for rehabilitation works comply with ILO standards</p> <p><b>Unlikely x Marginal = Low</b></p>	<p>2 – This investment will deliver improved warning and understanding of high tides and enable better preparation for protection against sea water ingress into agricultural areas. This will help build local resilience to all the communities living in close proximity to the sea in Prey Nob district. It is generally the case that the poorest and most marginalized live in informal settlements on the edge of the mangrove and these communities stand the most to gain from improved flood warnings.</p> <p>6 - Safety equipment will be required for workers on the site. For further general information on Core Labour Rights as part of the Environmental and Social Safeguard approach of the project, please also refer to the proposal document, <a href="#">Part II, Section K</a>.</p> <p>Need to ensure any contractors engaged for rehabilitation</p>	<p>Attendance sheets with quota numbers and photographs</p> <p>Consultation notes</p> <p>Signatures of acceptance of works and locations</p> <p>Verification of design</p> <p>Construction supervision, health and safety manager on site.</p> <p>Check for compliance</p>	<p>Pre-commencement and post meeting/consultation, Local Project Manager</p> <p>Pre-commencement, certified engineer</p> <p>Pre-commencement and daily Contractor</p> <p>Pre-commencement, Local Project Manager</p>



		works comply with ILO standards, by, for example, providing safety equipment (where necessary), employing adults under contracts, non-discrimination and paying fair salaries above the national minimum wage.	with ILO standards	
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## **Annex 4 – Example Agreement of Cooperation**

Below is an example agreement of cooperation used in Laos. This would serve as a template for agreement of cooperation to be used under this project between UN-Habitat and the NCSD. It fully incorporates the projects outputs as well as the roles and responsibilities of the executing partner.

### **AGREEMENT OF COOPERATION**

**between**

**THE UNITED NATIONS HUMAN SETTLEMENTS PROGRAMME**

**and**

**NAM PAPA STATE-OWNED ENTERPRISE ATTAPEU, LAO PDR**

**[... DISTRICTS]**

**THIS AGREEMENT OF COOPERATION** (the “Agreement”) is entered into by the United Nations Human Settlements Programme, originally established as the United Nations Centre for Human Settlements by resolution of the General Assembly of the United Nations 32/162 of 19 December 1977, and thereafter transformed into a subsidiary organ of the General Assembly of the United Nations by its resolution 56/206 of 21 December 2001, with Headquarters in Nairobi, Kenya (“UN-Habitat”); and the Nam Papa State-Owned Enterprise Attapeu established in 1998 under the Business Law No. 03/94/NA, which was superseded by the Enterprise Law No. 09/NA dated 09 Nov 2005, and mandated with the delivery of safe water according to PM Decree No. 37 to the citizens of Attapeu Province, with Headquarters in ... Districts, Attapeu Province, Lao PDR (“NPSE-ATTAPEU”);

**WHEREAS**, UN-Habitat is the coordinating agency within the United Nations System for human settlements activities and focal point for monitoring, evaluation and implementation of the Habitat Agenda, as well as the task manager of the human settlements chapter of Agenda 21 and responsible for promoting and consolidating collaboration with all partners, including local authorities and private and non-governmental organizations in the implementation of the Habitat Agenda and the Millennium Development Goals of significantly improving the lives of at least 100 million slum dwellers by the year 2020; and

**WHEREAS**, NPSE-ATTAPEU is a state-owned enterprise responsible for the delivery of safe water to the citizens of Attapeu Province, Lao PDR and its mandate is to finance, implement, and manage and operate all formalized water supply systems in the urban areas of Attapeu Province. It is required to provide safe water, at least cost to its consumers, whilst covering all costs, such as debt service, depreciation, and operation and maintenance. NPSE-ATTAPEU reports to the Department of Housing and Urban Planning (“DHUP”), which is under the aegis of

the Ministry of Public Works and Transport (“MPWT”). DHUP provides technical and management guidelines to the NPSEs.

**NOW, THEREFORE**, on the basis of mutual trust and in the spirit of friendly cooperation, UN-Habitat and NPSE-ATTAPEU, (the “Parties”) have entered into this Agreement.

## **Article I**

### **Documents**

1. This Agreement consists of this document and the following Annexes that form the integral part of it:
  - (a) Annex A (“General Terms and Conditions”). NPSE-ATTAPEU is named “Cooperating Entity/Contractor” in this Annex.
  - (b) Annex B (Project Document and Work Plan”, including Implementation Schedule); and
  - (c) Annex C (“Budget”, including Payment Schedule).
  
2. The Parties agree that in the event and to the extent of any conflict between the terms and conditions of this document and the Annexes or between any of the Annexes, this document shall prevail, followed by the Annexes in the order enumerated above.

## **Article II**

### **Objectives and Scope**

1. The purpose of this Agreement is to establish the general terms and conditions under which the Parties shall collaborate to achieve the objectives to be set out below for both UN-Habitat and NPSE-ATTAPEU through collaborative work. The technical expertise from both organizations, which shall be used in this collaboration, would allow a more effective and efficient utilization of resources made available to both UN-Habitat and NPSE-ATTAPEU.
  
2. Subject to their respective regulations, rules, policies, practice, procedures and availability of funds, the Parties shall collaborate to implementing the construction of climate change and disaster resilient infrastructure in the Districts of ..., Attapeu Province, Lao PDR (the “Project”), within the Adaptation project ‘Enhancing the climate and disaster resilience of the most vulnerable rural and emerging urban human settlements in Lao PDR.’
  
3. The project aims at supporting .....
  
4. The Project, which is described in a more detailed manner in ANNEX B hereto, aims at .....

## **Article III**

## **General Responsibilities of the Parties**

1. The Parties agree to carry out their respective responsibilities in accordance with the provisions of this Agreement. The Parties agree to join efforts and to maintain close working relationships in order to achieve the objectives of the Project.
2. The Parties shall keep each other informed of all relevant activities pertaining to the Project, and shall hold consultations every one (1) month, or at any time as any Party considers it appropriate, on the status of this cooperation, including any circumstances that may affect the achievement of its objectives.
3. The Parties shall refrain from any action that may adversely affect the interests of the other party and shall fulfill their commitments with fullest regard for the terms and conditions of this Agreement and the principles of the United Nations and UN-Habitat. The Parties shall keep the United Nations Resident Coordinator in Lao PDR and UN-Habitat's Human Settlements Officer ROAP responsible for Laos, as well as the Chief Technical Advisor Laos, fully informed of all actions undertaken by them in carrying out this Agreement.

### **Article IV**

#### **Responsibilities of UN-Habitat**

1. Under this Agreement, UN-Habitat, through its Regional Office of Asia-Pacific, shall be responsible for the overall supervision and backstopping of the project execution, including:
  - (a) Advising, as appropriate, NPSE-ATTAPEU in setting up the project work plan and implementation modalities;
  - (b) Providing funds to NPSE-ATTAPEU to a maximum of USD..... for undertaking the activities as set out in Annex B;
  - (c) Reviewing and monitoring the activities of the project including design and procurement;
  - (d) Maintaining communication with the main coordinating agency, the Department of Housing and Urban Planning of the Ministry of Public Works and Transport, regarding this collaboration and facilitating the presentation of main achievements and lessons learned;
  - (e) Keeping a dialogue with major partners involved on implementation of a pro-poor policy in .... Districts with regard to resilient infrastructure connection, tariff structure and related issues; and
  - (f) Reviewing and validating progress reports prepared by NPSE-ATTAPEU.

### **Article V**

#### **Responsibilities of NPSE-ATTAPEU**

1. Under this Agreement, NPSE-ATTAPEU shall be responsible for the implementation of the Project as described in Annex B, including:

- (a) Arranging and coordinating the technical studies, project surveys, designs, and procurement of goods and services;
- (b) Together with the administration authority of .... District and the beneficiaries, implementing all resilient infrastructure facilities;
- (c) Developing a participatory framework with the community for project implementation;
- (d) Facilitating and participating in stakeholders meetings on pro-poor policies related to increasing access to improved and affordable resilient infrastructure facilities;
- (e) Participating as necessary in all capacity building initiatives;
- (f) Monitoring project activities in coordination with the community; and
- (g) Reporting regularly to UN-HABITAT on the progress of the project implementation and prepare all project reports as required.

## Article VI

### Financial Arrangements

1. As part of the UN-Habitat cooperation under this Agreement, and in accordance with Annexes B and C, UN-Habitat shall provide NPSE-ATTAPEU, with funds up to a maximum amount of USD.... (US Dollars ....) in accordance with the following schedule:

- (a) The first installment of USD..... (US Dollars ....), equivalent to ...% of the maximum amount set out in this Article, shall be made available upon signature of this Agreement by the Parties and receipt by UN-Habitat of a payment request.
- (b) A second installment of USD.... (US Dollars ....), equivalent to ...% of the maximum amount set out in this Article, shall be made available, provided that UN-Habitat is satisfied that NPSE-ATTAPEU is in compliance with this Agreement (outputs indicated in the Payment Schedule have been provided), a submission of a financial statement showing the use of funds so far provided, as certified by the competent financial authority of NPSE-ATTAPEU, and a payment request.
- (c) Etc.

2. UN-Habitat shall make the above payments within thirty (30) days following the receipt of the appropriate payment request. The statements referred to above shall be itemized as per budget in Annex C. Supporting documents shall be available to UN-Habitat upon request, together with payment request.

3. Payments shall be made by UN-Habitat in United States Dollars in the following bank account

Bank Name: ...

Bank Address: ...

Account Title: ...

Account Number: ...

Swift Code: ...

Signatories (2): ...

4. UN-Habitat shall not make any payment for costs in excess of the maximum amount indicated in paragraph 1 above or in any duly signed amendment thereof, or which are otherwise not in accordance with this Agreement.

5. NPSE-ATTAPEU is authorized to make variations not exceeding 10 percent on any one budget line item, as set out in Annex C hereto, provided that the maximum amount set out in paragraph 1 above is not exceeded. Any variation exceeding that percentage must be previously approved in writing by UN-Habitat.

6. Within thirty (30) days, NPSE-ATTAPEU shall refund to UN-Habitat, upon its written request, any funds provided in excess of the maximum amount set out in paragraph 1 above, or any duly signed amendment thereof. Likewise, NPSE-ATTAPEU shall refund to UN-Habitat any non-duly authorized disbursements. UN-Habitat may deduct such refunds from future payments due to NPSE-ATTAPEU under this Agreement, or otherwise, or recover them by any other means, as UN-Habitat may consider appropriate and necessary.

7. NPSE-ATTAPEU shall report to UN-Habitat on any interest earned from funds above. Such interests shall be used by NPSE-ATTAPEU in agreement with UN-Habitat for the purposes of the Project.

8. NPSE-ATTAPEU shall provide UN-Habitat with certified audited report on the use of funds.

9. Upon termination of this Agreement, NPSE-ATTAPEU shall refund to UN-Habitat, within thirty (30) days of the date of termination, any fund, which may have not been disbursed or legally committed to that date.

10.

## **Article VII**

### **Reporting Requirements, Maintenance of Records and Audit**

1. NPSE-ATTAPEU shall prepare and submit to UN-Habitat, progress narrative and financial report every six (6) months.

2. Within ninety (90) days of the completion of the Project or of the termination of the Project, NPSE-ATTAPEU, in consultation with and inputs by UN-Habitat, shall prepare and submit to UN-Habitat a final narrative and financial report on the outcome of the Project.

3. Also, upon completion of the Project, NPSE-ATTAPEU shall maintain the records relating to the Project for a period of at least six (6) years, unless otherwise agreed upon between the Parties.
4. UN-Habitat has the right, at its own expense, to have the records of NPSE-ATTAPEU pertaining to the implementation of the Project reviewed and audited.
  - (a) NPSE-ATTAPEU shall facilitate inspection and audit of the Project by the United Nations Office of the Internal Oversight Services, or any other person duly authorized by UN-Habitat. Should they at any time wish to do so, the United Nations Board of Auditors may also carry out an audit of the Project. Audits of the Project shall include, *inter alia*, the examination of the Project accounting records in order to determine that the charging of administrative and operational support costs to the Project complies with those specified in the annexes to this Agreement. For auditing purposes, Project accounting records shall be retained for the six (6) years following the completion of the Project; and
  - (b) NPSE-ATTAPEU shall facilitate visits by the duly authorised persons to the Project site(s) to evaluate the progress and achievements of the Project during its period of implementation or thereafter.
5. NPSE-ATTAPEU, in consultation with UN-Habitat, shall engage an audit firm to conduct an independent audit of the Project as required in paragraphs Article VI.1.c and 1.d. The audit report shall state whether the financial accounts on the use of the funds provided to NPSE-ATTAPEU give a true and fair view of the financial condition and performance of the Project over the period of its operation, the expenditures have been incurred in accordance with the objectives outlined in this Agreement and that all project expenditures are supported by adequate documentation. The report should include such comments as the auditor may deem appropriate in respect of Project operations generally.

## **Article VIII**

### **Miscellaneous**

1. This Agreement shall enter into force upon signature by Parties, being effective from the date of the latest signature, and shall remain valid for a period of twenty four months (24) months, or until the date on which the activities, as set forth in Annex B hereto, are orderly completed or when the Parties decide to terminate them, whichever comes first.
2. Should it become evident that an extension of the duration is required, or that any other change should be made, the Parties shall record such a change in an Amendment/Addendum to this Agreement in accordance with the procedure set forth in clause 21 of Annex A.

3. Any notice required to be given by either Party under this Agreement shall be given in writing and shall be deemed given when actually received by the other party, to the following addresses:

<u>To UN-Habitat</u>	<u>To NPSE-ATTAPU</u>
<b>For Operational Matters:</b>	<b>For Operational Matters:</b>
Name : ...	Name : ...
Title : ...	Title : ...
Address : ...	Address : ...
Tel : ...	Tel : ...
Fax : ...	Fax : ...
Email : ...	
<b>For Financial &amp; Policy Matters:</b>	<b>For Financial &amp; Policy Matters:</b>
Name : ...	Name : ...
Title : ...	Title : ...
Address : ...	Address : ...
Tel : ...	Tel : ...
Fax : ...	Fax : ...
Email : ...	

**IN WITNESS WHEREOF** the undersigned duly authorized representatives of UN-Habitat and NPSE-ATTAPU, have signed this Agreement in two original copies at the place and on the day below written.

<b>UN-Habitat</b>	<b><u>NPSE-ATTAPU</u></b>
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<p>_____</p> <p>...</p> <p><b>Place:</b> ...</p> <p><b>Date:</b> _____</p>	<p>_____</p> <p>...</p> <p><b>Place:</b> ...</p> <p><b>Date:</b> _____</p>
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# Annex A

## GENERAL TERMS AND CONDITIONS

### **1.0 LEGAL STATUS**

The Cooperating Entity/Contractor shall be considered as having the legal status of an independent Cooperating Entity/Contractor *vis-à-vis* UN-Habitat. The Cooperating Entity's/Contractor's personnel and sub-contractors shall not be considered in any respect as being the employees or agents of UN-Habitat.

### **2.0 SOURCE OF INSTRUCTIONS**

The Cooperating Entity/Contractor shall neither seek nor accept instructions from any authority external to UN-Habitat in connection with the performance of its services under this Agreement/Contract. The Cooperating Entity/Contractor shall refrain from any action that may adversely affect the United Nations or UN-Habitat and shall fulfill its commitments with the fullest regard to the interests of UN-Habitat.

### **3.0 COOPERATING ENTITY/CONTRACTOR'S RESPONSIBILITY FOR EMPLOYEES**

The Cooperating Entity/Contractor shall be responsible for the professional and technical competence of its employees and will select, for work under this Agreement/Contract, reliable individuals who will perform effectively in the implementation of this Agreement/Contract, respect the local customs, and conform to a high standard of moral and ethical conduct.

### **4.0 ASSIGNMENT**

The Cooperating Entity/Contractor shall not assign, transfer, pledge or make other disposition of this Agreement/Contract or any part thereof, or any of The Cooperating Entity's/Contractor's rights, claims or obligations under this Agreement/Contract except with the prior written consent of UN-Habitat.

### **5.0 SUB-CONTRACTING**

In the event the Cooperating Entity/Contractor requires the services of sub-contractors, the Cooperating Entity/Contractor shall obtain the prior written approval and clearance of UN-Habitat for all sub-contractors. The approval of UN-Habitat of a sub-contractor shall not relieve The Cooperating Entity/Contractor of any of its obligations under this Agreement/Contract. The terms of any sub-contract shall be subject to and conform to the provisions of this Agreement/Contract.

### **6.0 OFFICIALS NOT TO BENEFIT**

The Cooperating Entity/Contractor warrants that no official of the United Nations and UN-Habitat has received or will be offered by the Cooperating Entity/Contractor any direct or indirect benefit arising from this Agreement/Contract or the award thereof. The Cooperating Entity/Contractor agrees that breach of this provision is a breach of an essential term of this Agreement/Contract.

### **7.0 INDEMNIFICATION**

The Cooperating Entity/Contractor shall indemnify, hold and save harmless, and defend, at its own expense, UN-Habitat, its officials, agents, servants and employees from and against all suits, claims, demands, and liability of any nature or kind, including their costs and expenses, arising out of acts or omissions of the Cooperating Entity/Contractor, or the Cooperating Entity/Contractor's employees, officers, agents or sub-contractors, in the performance of this Agreement/Contract. This provision shall extend, *inter alia*, to claims and liability in the nature of workmen's compensation, products liability and liability arising out of the use of patented inventions or devices, copyrighted material or other intellectual property by the Cooperating Entity/Contractor, its employees, officers, agents, servants or sub-contractors. The obligations under this Article do not lapse upon termination of this Agreement/Contract.

### **8.0 INSURANCE AND LIABILITIES TO THIRD PARTIES**

**8.1** The Cooperating Entity/Contractor shall provide and thereafter maintain insurance against all risks in respect of its property and any equipment used for the execution of this Agreement/Contract.

**8.2** The Cooperating Entity/Contractor shall provide and thereafter maintain all appropriate workmen's compensation insurance, or the equivalent, with respect to its employees to cover claims for personal injury or death in connection with this Agreement/Contract.

**8.3** The Cooperating Entity/Contractor shall also provide and thereafter maintain liability insurance in an adequate amount to cover third party claims for death or bodily injury, or loss of or damage to property, arising from or in connection with the provision of services under this Agreement/Contract or the operation of any vehicles, boats, airplanes or other equipment owned or leased by the Cooperating Entity/Contractor or its agents, servants, employees or sub-contractors performing work or services in connection with this Agreement/Contract.

**8.4** Except for the workmen's compensation insurance, the insurance policies under this Article shall:

**8.4.1** Name UN-Habitat as additional insured;

**8.4.2** Include a waiver of subrogation of the Cooperating Entity/Contractor's rights to the insurance carrier against UN-Habitat; and

**8.4.3** Provide that UN-Habitat shall receive thirty (30) days written notice from the insurers prior to any cancellation or change of coverage.

**8.5** The Cooperating Entity/Contractor shall, upon request, provide UN-Habitat with satisfactory evidence of the insurance required under this Article.

## **9.0 ENCUMBRANCES/LIENS**

The Cooperating Entity/Contractor shall not cause or permit any lien, attachment or other encumbrance by any person to be placed on file or to remain on file in any public office or on file with UN-Habitat against any monies due or to become due for any work done or materials furnished under this Agreement/Contract, or by reason of any other claim or demand against the Cooperating Entity/Contractor.

## **10.0 TITLE TO EQUIPMENT**

Title to any equipment and supplies that may be furnished by UN-Habitat shall rest with UN-Habitat and any such equipment shall be returned to UN-Habitat at the conclusion of this Agreement/Contract or when no longer needed by the Cooperating Entity/Contractor. Such equipment, when returned to UN-Habitat, shall be in the same condition as when delivered to the Cooperating Entity/Contractor, subject to normal wear and tear. The Cooperating Entity/Contractor shall be liable to compensate UN-Habitat for equipment determined to be damaged or degraded beyond normal wear and tear.

## **11.0 COPYRIGHT, PATENTS AND OTHER PROPRIETARY RIGHTS**

**11.1** Except as is otherwise expressly provided in writing in the Agreement/Contract,] UN-Habitat shall be entitled to all intellectual property and other proprietary rights including, but not limited to, patents, copyrights, and trademarks, with regard to products, processes, inventions, ideas, know-how, or documents and other materials which the Cooperating Entity/Contractor has developed for UN-Habitat under the Agreement/Contract and which bear a direct relation to or are produced or prepared or collected in consequence of, or during the course of, the performance of the Agreement/Contract, and the Cooperating Entity/Contractor acknowledges and agrees that such products, documents and other materials constitute works made for hire for UN-Habitat.

**11.2** At the request of UN-Habitat, the Cooperating Entity/Contractor shall take all necessary steps, execute all necessary documents and generally assist in securing such proprietary rights and transferring or licensing them to UN-Habitat in compliance with the requirements of the applicable law.

**11.3** At the request of UN-Habitat, the Cooperating Entity/Contractor shall take all necessary steps, execute all necessary documents and generally assist in securing such proprietary rights and transferring or licensing them to UN-Habitat in compliance with the requirements of the applicable law and of this Agreement/Contract.

**11.4** Subject to the foregoing provisions, all maps, drawings, photographs, mosaics, plans, reports, estimates, recommendations, documents, and all other data compiled by or received by the Cooperating Entity/Contractor under the Agreement/Contract shall be the property of UN-Habitat, shall be made available for use or inspection by UN-Habitat at reasonable times and in reasonable places, shall be treated as confidential, and shall be delivered only to UN-Habitat authorized officials on completion of work under the Agreement/Contract.

## **12.0 USE OF NAME, EMBLEM OR OFFICIAL SEAL OF THE UNITED NATIONS AND UN-Habitat**

The Cooperating Entity/Contractor shall not advertise or otherwise make public the fact that it is a Cooperating Entity/Contractor with UN-Habitat, nor shall the Cooperating Entity/Contractor, in any manner whatsoever use the name, emblem or official seal of UN-Habitat or the United Nations, or any abbreviation of the name of UN-Habitat in connection with its business or otherwise.

## **13.0 CONFIDENTIAL NATURE OF DOCUMENTS AND INFORMATION**

Information and data that is considered proprietary by either Party and that is delivered or disclosed by one Party ("Discloser") to the other Party ("Recipient") during the course of performance of the Agreement/Contract, and that is designated as confidential ("Information"), shall be held in confidence by that Party and shall be handled as follows:

**13.1** The recipient ("Recipient") of such information shall:

**13.1.1** Use the same care and discretion to avoid disclosure, publication or dissemination of the Discloser's Information as it uses with its own similar information that it does not wish to disclose, publish or disseminate; and

**13.1.2** Use the Discloser's Information solely for the purpose for which it was disclosed.

**13.2** Provided that the Recipient has a written Agreement/Contract with the following persons or entities requiring them to treat the Information confidential in accordance with this Agreement/Contract and this Article 13, the Recipient may disclose Information to:

**13.2.1** Any other party with the Discloser's prior written consent; and

**13.2.2** The Recipient's employees, officials, representatives and agents who have a need to know such Information for purposes of performing obligations under the Agreement/Contract, and employees officials, representatives and agents of any legal entity that it controls, controls it, or with which it is under common control, who have a need to know

such Information for purposes of performing obligations under this Agreement/Contract, provided that, for these purposes a controlled legal entity means:

**13.2.2.1** A corporate entity in which the Party owns or otherwise controls, whether directly or indirectly, over fifty percent (50%) of voting shares thereof; or

**13.2.2.2** Any entity over which the Party exercises effective managerial control; or

**13.2.2.3** For UN-Habitat, a governing organ or subsidiary organ of UN-Habitat established in accordance with the Charter of UN-Habitat.

**13.3** The Cooperating Entity/Contractor may disclose Information to the extent required by law, provided that, subject to and without any waiver of the privileges and immunities of UN-Habitat, the Cooperating Entity/Contractor will give UN-Habitat sufficient prior notice of a request for the disclosure of Information in order to allow UN-Habitat to have a reasonable opportunity to take protective measures or such other action as may be appropriate before any such disclosure is made.

**13.4** UN-Habitat may disclose Information to the extent as required pursuant to the Charter of United Nations, resolutions or regulations of the General Assembly, or rules promulgated by the Secretary-General.

**13.5** The Recipient shall not be precluded from disclosing Information that is obtained by the Recipient from a third party without restriction, is disclosed by the Discloser to a third party without any obligation of confidentiality, is previously known by the Recipient, or at any time is developed by the Recipient completely independently of any disclosures hereunder.

**13.6** These obligations and restrictions of confidentiality shall be effective during the term of the Agreement/Contract, including any extension thereof, and, unless otherwise provided in the Agreement/Contract, shall remain effective following any termination of the Agreement/Contract.

#### **14.0 FORCE MAJEURE; OTHER CHANGES IN CONDITIONS**

**14.1** In the event of and as soon as possible after the occurrence of any cause constituting *force majeure*, The Cooperating Entity/Contractor shall give notice and full particulars in writing to UN-Habitat, of such occurrence or change if the Cooperating Entity/Contractor is thereby rendered unable, wholly or in part, to perform its obligations and meet its responsibilities under this Agreement/Contract. The Cooperating Entity/Contractor shall also notify UN-Habitat of any other changes in conditions or the occurrence of any event that interferes or threatens to interfere with its performance of this Agreement/Contract. On receipt of the notice required under this Article, UN-Habitat shall take such action as, in its sole discretion; it considers to be appropriate or necessary in the circumstances, including the granting to the Cooperating Entity/Contractor of a reasonable extension of time in which to perform its obligations under this Agreement/Contract.

**14.2** If the Cooperating Entity/Contractor is rendered permanently unable, wholly, or in part, by reason of *force majeure* to perform its obligations and meet its responsibilities under this Agreement/Contract, UN-Habitat shall have the right to suspend or terminate this Agreement/Contract on the same terms and conditions as are provided for in Article 15, "Termination", except that the period of notice shall be seven (7) days instead of thirty (30) days.

**14.3** *Force majeure* as used in this Article means acts of God, war (whether declared or not), invasion, revolution, insurrection, or other acts of a similar nature or force.

**14.4** The Cooperating Entity/Contractor acknowledges and agrees that, with respect to any obligations under this Agreement/Contract that the Cooperating Entity/Contractor must perform in or for any areas in which UN-Habitat is engaged in, preparing to engage in, or disengaging from any peacekeeping, humanitarian or similar operations, any delays or failure to perform such obligations arising from or relating to harsh conditions within such areas or to any incidents of civil unrest occurring in such areas shall not, in and of itself, constitute *force majeure* under the Agreement/Contract.

#### **15.0 TERMINATION**

**15.1** Either party may terminate this Agreement/Contract for cause, in whole or in part, upon thirty (30) days notice, in writing, to the other party. The initiation of arbitral proceedings in accordance with Article 16.2 ("Arbitration"), below, shall not be deemed a termination of this Agreement/Contract.

**15.2** UN-Habitat may terminate forthwith this Agreement/Contract at any time should the mandate or the funding of the Project be curtailed or terminated, in which case the Cooperating Entity/Contractor shall be reimbursed by UN-Habitat for all reasonable costs incurred by the Cooperating Entity/Contractor prior to receipt of the notice of termination.

**15.3** In the event of any termination by UN-Habitat under this Article, no payment shall be due from UN-Habitat to the Cooperating Entity/Contractor except for work and services satisfactorily performed in conformity with the express terms of this Agreement/Contract.

**15.4** Should the Cooperating Entity/Contractor be adjudged bankrupt, or be liquidated or become insolvent, or should the Cooperating Entity/Contractor make an assignment for the benefit of its creditors, or should a Receiver be appointed on account of the insolvency of the Cooperating Entity/Contractor, UN-Habitat may, without prejudice to any other right or

remedy it may have under the terms of these conditions, terminate this Agreement/Contract forthwith. The Cooperating Entity/Contractor shall immediately inform the UN of the occurrence of any of the above events.

## 16.0 SETTLEMENT OF DISPUTES

**16.1 Amicable Settlement** The Parties shall use their best efforts to settle amicably any dispute, controversy or claim arising out of this Agreement/Contract or the breach, termination or invalidity thereof. Where the parties wish to seek such an amicable settlement through conciliation, the conciliation shall take place in accordance with the UNCITRAL Conciliation Rules then obtaining, or according to such other procedure as may be agreed between the parties.

**16.2 Arbitration:** Any dispute, controversy, or claim between the Parties arising out of the Agreement/Contract or the breach, termination, or invalidity thereof, unless settled amicably under Article 16.1, above, within sixty (60) days after receipt by one Party of the other Party's written request for such amicable settlement, shall be referred by either Party to arbitration in accordance with the UNCITRAL Arbitration Rules then obtaining. The decisions of the arbitral tribunal shall be based on general principles of international commercial law. For all evidentiary questions, the arbitral tribunal shall be guided by the Supplementary Rules Governing the Presentation and Reception of Evidence in International Commercial Arbitration of the International Bar Association, 28 May 1983 edition. The arbitral tribunal shall be empowered to order the return or destruction of goods or any property, whether tangible or intangible, or of any confidential information provided under the Agreement/Contract, order the termination of the Agreement/Contract, or order that any other protective measures be taken with respect to the goods, services or any other property, whether tangible or intangible, or of any confidential information provided under the Agreement/Contract, as appropriate, all in accordance with the authority of the arbitral tribunal pursuant to Article 26 ("Interim Measures of Protection") and Article 32 ("Form and Effect of the Award") of the UNCITRAL Arbitration Rules. The arbitral tribunal shall have no authority to award punitive damages. In addition, unless otherwise expressly provided in this Agreement/Contract, the arbitral tribunal shall have no authority to award interest in excess of the London Inter-Bank Offered Rate ("LIBOR") then prevailing, and any such interest shall be simple interest only. The Parties shall be bound by any arbitration award rendered as a result of such arbitration as the final adjudication of any such dispute, controversy, or claim.

## 17.0 PRIVILEGES AND IMMUNITIES

Nothing in or relating to this Agreement/Contract shall be deemed a waiver, express or implied, of any of the privileges and immunities of the United Nations, including UN-Habitat.

## 18.0 TAX EXEMPTION

**18.1** Section 7 of the Convention on the Privileges and Immunities of the United Nations provides, *inter-alia*, that United Nations, including UN-Habitat, is exempt from all direct taxes, except charges for public utility services, and is exempt from customs duties and charges of a similar nature in respect of articles imported or exported for its official use. In the event any governmental authority refuses to recognize UN-Habitat exemption from such taxes, duties or charges, the Cooperating Entity/Contractor shall immediately consult with UN-Habitat to determine a mutually acceptable procedure.

**18.2** Accordingly, the Cooperating Entity/Contractor authorizes UN-Habitat to deduct from the Cooperating Entity/Contractor's invoice any amount representing such taxes, duties or charges, unless the Cooperating Entity/Contractor has consulted with UN-Habitat before the payment thereof and UN-Habitat has, in each instance, specifically authorized the Cooperating Entity/Contractor to pay such taxes, duties or charges under protest. In that event, the Cooperating Entity/Contractor shall provide UN-Habitat with written evidence that payment of such taxes, duties or charges has been made and appropriately authorized.

## AF SAFEGAURDS:

### 19.0 COMPLIANCE WITH THE LAW

The proposed project will be executed in compliance with national and international laws.

- All project activities will be implemented in accordance with national laws.
- If required, Environmental Examination (IEE) will be completed for sub-projects.
- UN-Habitat adheres to UN-Host Country Agreements, which are operationalized within the proposed project to ensure clear and efficient communication between project staff and the Lao PDR Government.
- NPSE-ATTAPEU (and UN-Habitat) will comply with the following laws:
  - Lao PDR Urban Planning Law;
  - Participatory Land Use Planning (PLUP) and Planning for climate change guidelines;
  - Lao PDR Water and Resource Law;
  - Lao PDR Construction Law; Lao PDR Building Codes and Building Control;
  - Building Back Better Principles Guideline for Shelter and Sanitation;
  - The Lao National Unexploded Ordnance Programme;
  - Lao PDR Water Supply Law;

### 20.0 ACCESS AND EQUITY

The proposed project recognizes that vulnerable and marginalized sectors of the population often face limited access to services and resources. As such the proposed project will work to ensure the equity of benefits.

- One of the main objectives of the proposed project is to increase the sustainable access to basic infrastructure systems and services.

- NPSE-ATTAPEU (and UN-Habitat) will ensure that all stakeholders are informed of the resulting benefits of the project and have equitable access to these benefits.

### **21.0 MARGINALIZED AND VULNERABLE GROUPS**

The project will build the capacity of marginalized and vulnerable groups and increase climate resilience.

- Through capacity building training and community action planning workshops will enable vulnerable and marginalized groups to build resilience.
- Marginalized groups will be given equal opportunity and encouraged to engage with project development through meaningful participation at all settlement levels
- The proposed project will consider the needs for marginalized and vulnerable groups, along with youth, women, disabled people and ethnic groups at all stages of the project.
- Marginalized groups will be involved as active agents during stakeholder discussions and engagements.

NPSE-ATTAPEU (and UN-Habitat) will ensure above.

### **22.0 HUMAN RIGHTS**

The human rights principles underline all the work of UN-Habitat. The demonstrated implementation of HRBA across UN-Habitat projects will be continued throughout the development of the proposed project.

NPSE-Attapeu will be responsible for the delivery of resilient infrastructure to the community and urban areas. Within this responsibility NPSE-Attapeu agrees to develop a participatory framework with the community for project implementation and facilitate the participation of stakeholders within meetings relating to the components of the proposed project.

- A grievance mechanism will be established. This mechanism will ensure there is an open space for communities and households to share any instance of grievance, with a clear channel for a response and subsequent action taken as necessary.

The Precautionary Principle will be applied at all stages of the proposed project cycle. This principle was adopted into international law through the signing of the 1992 Rio Declaration, of which UN-Habitat is a signatory.

### **23.0 GENDER EQUITY AND WOMEN'S EMPOWERMENT**

Prior to project implementation, the UN-Habitat's Vulnerability Assessment (VA) will establish and recognize the needs of the marginalized and the vulnerable, including women. It will do this by using techniques such as women's only focus groups and collecting gender disaggregated data. Where the VA identifies vulnerable individuals or groups, recommend targeted and differentiated measures will ensure that the adverse impacts do not fall disproportionately on them.

- The building of small-scale community based resilient infrastructure will be implemented in a way that ensures the equity of benefits to all members of the community.
- As detailed in the ESMP UN-Habitat is a signatory to the UN Women Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) and the ILO Conventions No. 100, 111, 156 and 183, and as such the project will work to ensure that these conventions are upheld
  - UN-Habitat recognizes the importance of collaboration. Annex 5 of the project proposal, details consultations that were held with UN Women, UNICEF and OXFAM regarding issues of gender, to further strengthen the outcomes of the proposed project.
  - The project will include a quota system for female engagement within stakeholder participation and community committees
  - The established grievance mechanism will provide a channel to report any instances of discrimination.
  - Throughout project implementation gender and cultural sensitivity training will be promoted within disaster risk management.
- A specific objective of the proposed project is to ensure a gender balance for the water supply and sanitation sector.
- NPSE-ATTAPEU (and UN-Habitat) will support progress in Lao PDR towards Political Stability, Order, Justice and Gender Equality and will ensure gender equity within the development of disaster preparedness and risk mitigation.

### **24.0 CORE LABOUR RIGHTS**

The proposed project will engage closely with the Ministry of Labour and social welfare.

- As detailed within the ESMP, UN-Habitat is a signatory of all ILO conventions, and as such measures will be implemented at all stages of the proposed project cycle to ensure that these standards are being adhered to.
- Effective monitoring of the proposed project will further strengthen the compliance to Core Labour Rights.
- UN-Habitat's Grievance Mechanism will also provide an efficient channel to report instances of grievance, should they occur throughout the development of the proposed project.
- NPSE-ATTAPEU (and UN-Habitat) will support community ownership of the proposed project through engagement with the labour and construction of infrastructure.

### **25.0 INDIGENOUS PEOPLE**

Indigenous peoples are identified as important stakeholders to be involved throughout the development and implementation of the proposed project.

- UN-Habitat will engage representatives of communities from all groups of the population. A representative of Indigenous Peoples within this body of stakeholders will ensure that the opinions and particular challenges of indigenous peoples are heard and incorporated into the design of the proposed project.
- The proposed project will be designed and planned in a manner that respects and is sensitive to the needs and cultural practices of indigenous people and marginalized groups. This approach will ensure equal access and the equity of benefits resulting from resilient infrastructure.

UN-Habitat will consult external stakeholders (IFAD, OXFAM, CARE and Health Poverty Action) to further ensure the involvement and empowerment of indigenous peoples and the equity of benefits

NPSE-ATTAPUEU (and UN-Habitat) will support above.

#### **26.0 INVOLUNTARY RESETTLEMENT**

Throughout the full duration of the proposed project, no (sub-) project will be approved where there is the possibility, however small, that its implementation could result in forced eviction or involuntary resettlement.

No resettlement issues (voluntary or involuntary) are foreseen within the proposed project.

NPSE-ATTAPUEU (and UN-Habitat) will support above.

#### **27.0 PROTECTION OF NATURAL HABITATS**

Prior to the implementation of the proposed project, UN-Habitat will complete a Vulnerability Assessment. This will identify, through techniques such as GIS and community mapping, particular areas of natural habitats that could have the potential to be damaged during construction. Identifying these areas within the environmental impact assessment will ensure that the potential direct and indirect impacts are investigated and avoided.

In addition UN-Habitat has partnered with the following stakeholders to ensure the protection of Natural Habitats:

- Ministry of Natural resources and Environment; Ministry of Labour and Social Welfare; Mekong River Commission and UNEP

NPSE-ATTAPUEU (and UN-Habitat) will support above.

#### **28.0 CLIMATE CHANGE**

Climate Change is one of the four cross cutting pillars of UN-Habitat. As such the proposed project aligns with the Adaptation Fund Safeguard 11.

As detailed within the project proposal, Lao PDR will increasingly experience the exacerbated impacts of Climate Change and the poorest areas are predicted to be most severely affected. The proposed project will work to improve the resilience of infrastructure and increased the technical capacity of towns and villages in rural areas.

NPSE-ATTAPUEU (and UN-Habitat) will support above.

#### **29.0 POLLUTION PREVENTION AND RESOURCE EFFICIENCY**

UN-Habitat is committed to working towards the implementation of the Sustainable Development Goals. As such UN-Habitat recognizes that all projects must ensure the sustainable consumption of resources and prevent mal-adaptive practice leading to the polluting of surrounding areas.

- No pollution or resource use issues are foreseen throughout the implementation of the proposed project as no construction, infrastructure, appliances or raw materials are involved

In addition the proposed project will work to ensure that the community is trained in how to use resources efficiently and prevent further pollution to surrounding areas.

NPSE-ATTAPUEU (and UN-Habitat) will support above.

#### **30.0 PUBLIC HEALTH**

The proposed project has been developed in accordance with UN-Habitat's safeguard for Community health and safety.

- Throughout the scope of the proposed project no public health issues are foreseen.
- In addition, improved public health is a secondary impact area of this project

The environmental impact assessment will identify potential negative health impacts and will identify appropriate mitigation measures, which may, include, for example, filtration and treatment systems at the household level.

- The proposed project will support the INDC of Lao PDR to increase the resilience of public health infrastructure, and improve public health services for climate change adaptation.

NPSE-ATTAPUEU (and UN-Habitat) will support above.

#### **31.0 PHYSICAL AND CULTURAL HERITAGE**

UN-Habitat recognizes the need to protect and promote the importance of physical and cultural heritage.

- Within the scope of the proposed project, no physical or cultural heritage impacts are foreseen.
  - The UN-Habitat VA and the environmental and social impact assessment will review this claim and input additional measures as necessary.

- Information gathered from consultants and beneficiaries will further provide information to ensure that physical and cultural heritage sites are not negatively impacted by the proposed project.
- The project will be implemented by the local community, who are acknowledged as the best custodians of physical and cultural heritage sites within their locale.

NPSE-ATTAPEU (and UN-Habitat) will support above.

### **32.0 LANDS AND SOIL CONSERVATION**

Soils are recognized as integral to ecosystems and of great importance for nutrient cycling and interconnected feedbacks. It is recognised that the proposed project could lead to the unintended consequence of negatively impacting wildlife that depends on watershed for nutrition.

- As such the environmental and social impact assessment will identify the important ecosystem considerations that need to be upheld throughout project development and implementation.
- The proposed project will provide sustainable access to resilient infrastructure and conserve the development of major watersheds. These measures are in alignment with national socio-economic, climate change and disaster management priorities.

NPSE-ATTAPEU (and UN-Habitat) will support above.

### **33.0 AUTHORITY TO MODIFY**

No modification or change in this Agreement/Contract shall be valid and enforceable against UN-Habitat unless provided by an amendment to this Agreement/Contract signed by the Cooperating Entity/Contractor and a duly authorized official of UN-Habitat.



